A. E. S. CONVENTION BUFFALO, JULY 30 - AUG. 2, 1951

VOLUME 38
NUMBER 3

MARCH, 1951

plating

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ROTOGRAVURE ROLL MAKING

See Contents Page 237

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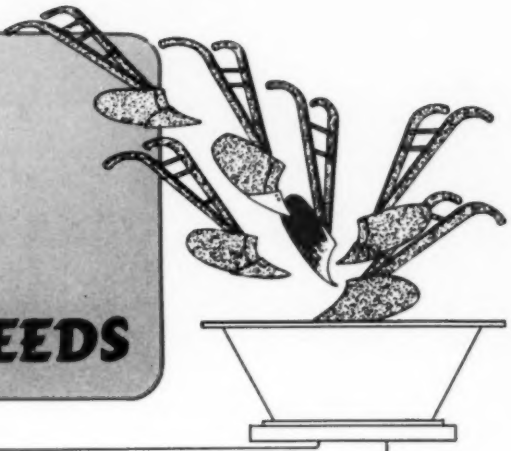
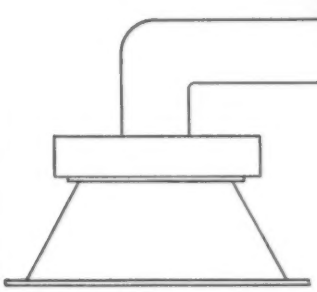




American Industry must now, regretfully, "beat our ploughshares into swords" again. Where plant change-overs call for cleaning, finishing and plating equipment and chemicals, we will be glad to help you.

EQUIPMENT

- Anodizing Process Equipment
- Rectifiers and Generators
- Tumbling Barrels
- Degreasers and Washing Machines
- Cadmium and Zinc Plating Equipment
- Anodizing and Plating Racks
- Hard Chrome Equipment

CHEMICALS

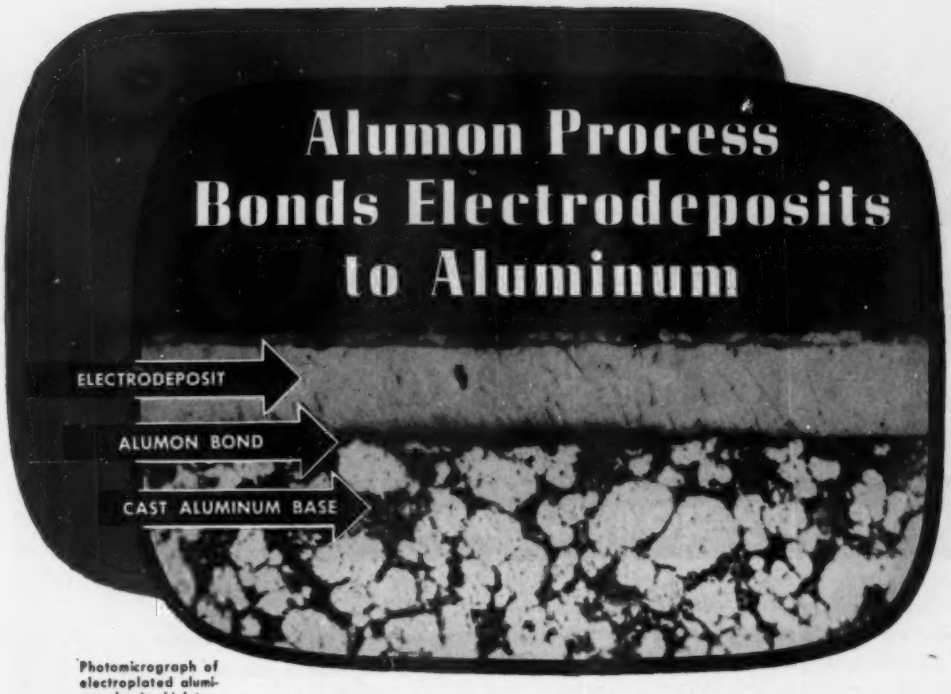
- Anodize Pre-Cleaners
- Anodize Strippers
- Deoxidizing Chemicals for Aluminum
- Shell Case Cleaners
- Tumbling Compounds for Gun Parts
- Wash Machine Cleaners
- Zinc Electroplate Stripper
- Plating Cleaners
- Jetal Black Oxide Process

FREDERICK GUMM Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.

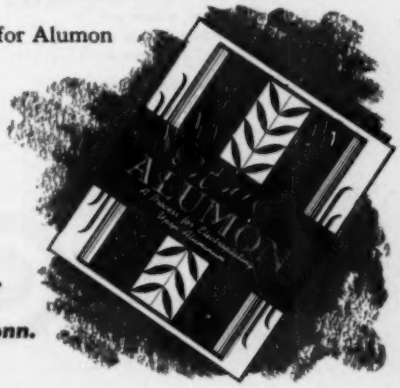
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 170.

Alumon Process Bonds Electrodeposits to Aluminum



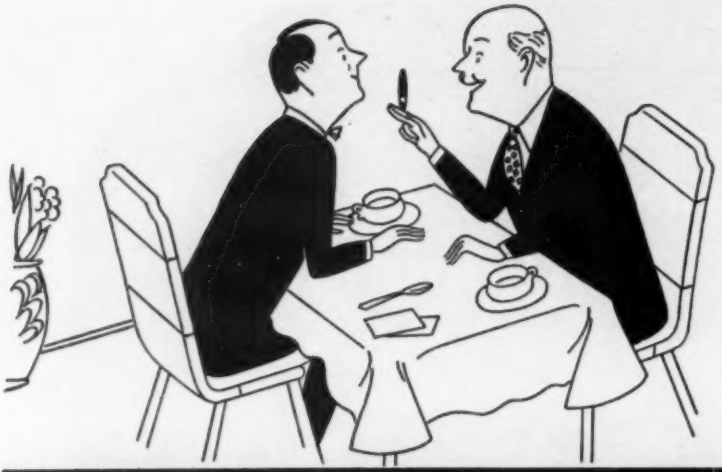
Photomicrograph of electroplated aluminum showing high tensile Alumon Bond.

Hundreds of manufacturers throughout the United States are now using electroplated aluminum. The Alumon process is simple. The work is merely cleaned, dipped in acid, dipped in Alumon and is then ready for electroplating with copper, nickel, and other metals. The process is suitable for plating most wrought and cast alloys . . . The cost of using alumon is low, being less than half a cent per square foot of surface area treated. The process can be fitted easily into regular plating cycles. Write today for Alumon Process bulletin and technical data on how you can use electroplated aluminum for your products.



Enthone INC.

442 Elm Street, New Haven, Conn.



"Take my advice, Joe..."

"You're just starting your own shop, and there is plenty of business around, especially on defense jobs. But, remember—you're new and you'll be on trial. Just deliver good stuff, on time, and you'll get along swell.

Listen—even though you haven't got much working capital, **buy only reliable equipment, equipment you can depend upon.** You can't make money if you spend your time servicing and repairing your own machinery.

Take rectifiers, for instance. Take my advice, Joe, and put your money on GREEN RECTIFIERS . . . they're dependable . . . and what a job they do do . . ."

P.S. . . *Joe made good. Not merely because he bought a GREEN RECTIFIER, but also because he was smart enough to take good advice.*

We have a number of interesting papers, written by qualified authorities, on rectifiers, and their applications. Available from us, or from our representatives, without charge or obligation.

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- CORL CHEMICAL CO., Seattle
- CROWN RHEOSTAT & SUPPLY CO., Chicago
- W. M. FOTHERINGHAM, Buffalo
- INDUSTRIAL CHEMICAL & EQUIPT. CO., Minneapolis
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Cuts Cleaning Time

Cowles HD-N Cleaner, the *new* heavy-duty soak cleaner for ferrous metals, will often do in 10 minutes what it takes other cleaners 30 minutes or more to do. It is specifically formulated as a straight or barrel soak for precleaning before plating, enameling, pickling, painting, back-shop reconditioning—or anywhere a heavy-duty cleaner is needed to remove stubborn types of soil.

The latest developments in metal cleaning research have been incorporated in HD-N to assure maximum detergency under all conditions of usage.

HD-N may also be used on such active metals as brass and zinc, if some attack is acceptable.

HD-N penetrates and removes such soils as oil, carbon, grease, drawing compound, graphite, road and shop dirt in *one* cleaning operation. It is fast, thorough, and does a complete job . . . is readily and completely soluble in hot water.

COWLES CHEMICAL COMPANY
Metal Cleaner Department
7016 Euclid Avenue • Cleveland 3, Ohio

WRITE FOR *complete information—the attached coupon is for your convenience.*

Cowles Chemical Company
7016 Euclid Avenue
Cleveland 3, Ohio

Please send me complete information on COWLES HD-N CLEANER.

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Company_____

Address_____

City_____ Zone____ State_____

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Guarantees Results

IT TAKES ONLY A FEW MINUTES
TO SAVE HUNDREDS OF MAN HOURS

Here is an easy way to produce the finishes you need quickly in large quantities — in the face of a tightening manpower situation. It takes only a few minutes to issue instructions for samples of your work to be sent to the Roto-Finish Company. There is no further work or cost involved on your part. It is then up to us to prove to you that Roto-Finishing will debur, polish or otherwise impart a better finish on your products while saving you time, manpower and money.

We guarantee to reproduce the same results in your plant that we have produced on your samples processed in our laboratory. Just think what this means to you:

- **All guess-work and costly trial-and-error purchase of equipment is eliminated.**
- **Your products are analyzed to determine which combination of equipment and materials will do the best job for you at the lowest cost . . . before you make any investment.**
- **You buy nothing until our analysis proves results will benefit you.**
- **When you buy, you get machines and materials that are properly combined for your job.**
- **Roto-Finish Engineers make periodic visits to your plant to supervise and demonstrate the use of Roto-Finish processes, to train your operators, and offer helpful suggestions to improve your products wherever possible.**
- **The Roto-Finish Company manufacture their own materials so they can control the uniformity of quality and size — another reason why it is possible for Roto-Finish to guarantee results.**

Avail yourself of the unusual engineering skill and ability which is found at the Roto-Finish Company. Make use of the Roto-Finish laboratory, the best equipped in its field. Send in your samples today.

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ORIGINATORS OF THE ROTO-FINISH PROCESSES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 174.

Industry News

A. S. T. M. Spring Meeting. The preliminary program for meetings of committees in Netherland Plaza Hotel, Cincinnati, Ohio, includes the following: B-3 on Corrosion of Nonferrous Metals and Alloys on March 6; Subcommittees of A-5 on Corrosion of Iron and Steel on March 7; B-6 on Diecast Metals and Alloys, including subcommittees, on March 7; Subcommittees of D-19 on Industrial Water, including Subcommittee VII on Waterborne Industrial Wastes, on March 7–8 and main Committee on March 9; Subcommittees of B-8 on Electrodeposited Metallic Coatings on March 7–9, main Committee on March 9.

Detroit Chemical Specialties, Inc., early in 1951, will move into its new and larger quarters at 101 S. Waterman St., Detroit, occupying a modern structure of approximately 26,000 sq ft.

Remodeled, the plant is equipped with the most modern steam-jacketed mixing kettles, extruding machines, and other equipment for manufacture of rubbing and polishing compounds. Manufacturing standards are maintained by a well-equipped chemical laboratory and a staff with long experience in this field.

Charles H. McAleer, President, is a veteran in the manufacture of rubbing compounds and polishes. He organized the McAleer Manufacturing Company in 1923 and served as its president until 1941, when he disposed of his interests. After a period in the Army Air Forces, he organized, in 1946, the Detroit Chemical Specialties, Inc., to manufacture rubbing compounds, polishes and waxes, and a complete line of platers' supplies.

Pontiac Changes to Bright Acid Copper. During the recent shutdown at the Pontiac plating plant for model changeover, the **George L. Nankervis Company,** Detroit, Mich., reworked the main copper line to allow use of bright acid copper for higher-current-density plating and less buffing than was used with the former process.

The change required all new acid-resistant accessory equipment for solution circulation, filtration, agitation, and tem-

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LET US SUPPLY YOUR NEEDS FOR YOUR PLATING OR POLISHING DEPARTMENT

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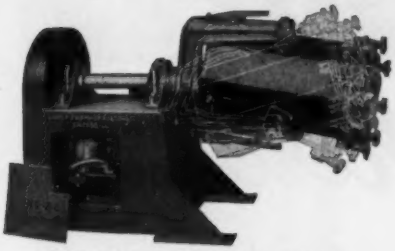
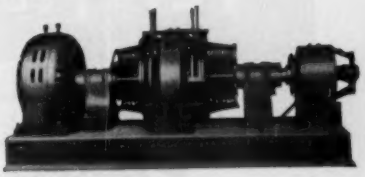
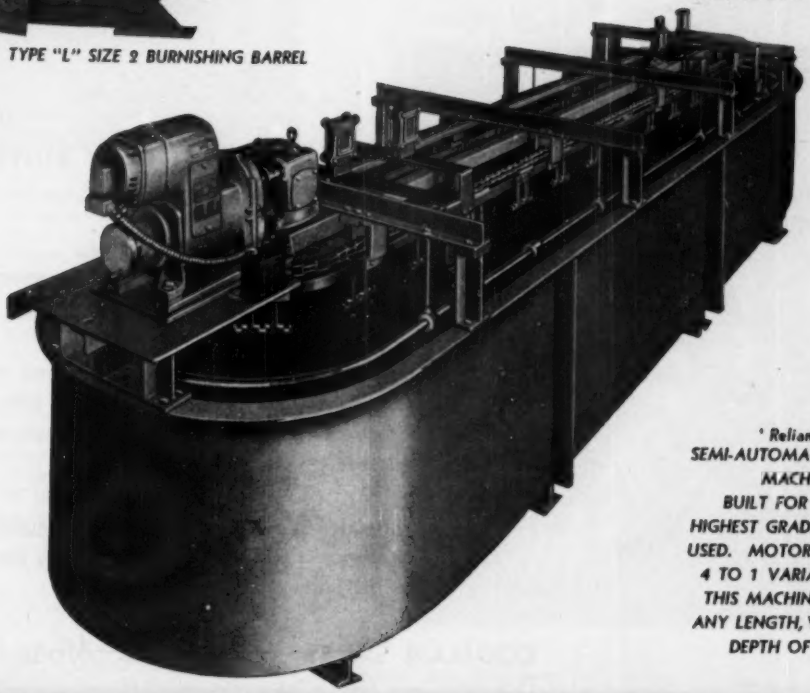


TYPE "L" SIZE 2 BURNISHING BARREL



3000 AMP. 6 VOLT GENERATOR SET



"Reliance"
SEMI-AUTOMATIC PLATING MACHINE
BUILT FOR SERVICE
HIGHEST GRADE MATERIAL USED. MOTOR ¾ to 1 HP
4 TO 1 VARIABLE SPEED.
THIS MACHINE IS BUILT ANY LENGTH, WIDTH AND DEPTH OF TANK.

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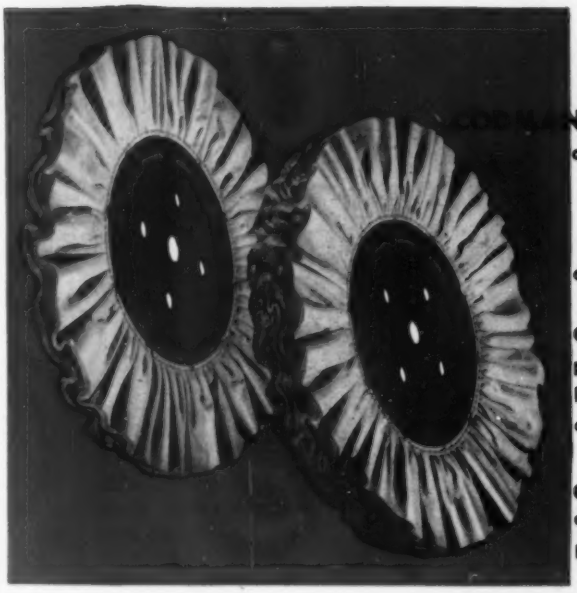

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CODMAN *Ventilated* NON-FRAY BUFFS
are the most EFFICIENT
ECONOMICAL
HARDER WORKING
LONGER LASTING BUFFS
designed for every operation.

Codman Buffs are AIR-COOLED, engineered to provide maximum ventilation under most gruelling conditions regardless of speed and extent of operation.

CODMAN *Ventilated* NON-FRAY BUFFS cut down your production costs, and increase your profits.

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THE CODMAN NON-FRAY VENTILATED BUFFS ARE MADE UNDER PATENT NUMBERS 2,027,863; 2,094,650; 1,573,961; RE. 19,694; 2,140,208; OTHER PATENTS PENDING

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COMPANY
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For Over 50 Years the Greatest Name in Buffs

perature control. Additional generators were installed bringing the power supply to 75,000 amperes. Actual down time for the change was only eleven days.

The Diversey Corporation's 18th annual general sales conference, held for five days in December in the Edgewater Beach Hotel, Chicago, dealt to a large extent with problems of selling in an economy gradually being transformed from a peacetime to an all-out preparedness basis.

Arthur H. (Red) Motley, President of Parade Publications (second from left), is congratulated by Chairman H. W. Kochs of The Diversey Corporation, Chicago, following his address at the corporation's sales conference. Others in the picture are W. E. Noyes, Vice-President in charge of sales (extreme left), and L. A. Armstrong, Convention Manager

Three hundred Diversey representatives from the United States and Canada —field service engineers, divisional and district managers and senior salesmen— were gathered to learn about new products, including metal cleaners, and new sales and service techniques.

Tumb-L-Matic, Inc., is the new name of **Lupomatic Industries, Inc.** According to Charles W. Yerger, President, the change has been made to capitalize on the success of tumbling processes, equipment and supplies developed during the past year and sold under the trademark Tumb-L-Matic. The company continues to be located at 4510 Bullard Ave., New York 70, N. Y.

Belke Detroit Office Moved. The Belke Sales Office in Detroit has been moved to larger quarters in a new, modern building at 10700 Puritan Ave., according to an announcement by the Belke Manufacturing Company, Chicago.

Foster D. Snell de Mexico, S. de R. L. of Apartado 20.609, Mexico City, has been formed to solve consulting, development, and engineering problems in Central America, particularly in Mexico. Messrs. J. Carner and J. Sperling in

SARAN LINED steel pipe

WHAT part of industry's six billion dollar corrosion bill are you paying? Any amount is too much and can be cut considerably through the installation of saran lined steel pipe. You will find, as have many of the country's leading manufacturers, that saran lined steel pipe means dependable, long term operation. In addition to the excellent corrosion resistance of this remarkable pipe —you have the plus values of rigidity, pressure strength and ease of installation, requiring NO special tools. These advantages are all important to you in the reduction of shut-down time, lost production and equipment replacement.

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product

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charge of the new subsidiary in Mexico City will be available for consultation, but it is anticipated that for the present laboratory and engineering facilities at New York City and Bainbridge, N. Y., will suffice.

Anglo-Dutch Plating Conference. Twenty-eight British members of the Electrodepositors' Technical Society and about seventy members of the Studiekring Galvanotechniek of Holland met for a joint meeting in Scheveningen, Holland on September 27-30. All sessions were conducted in English, and the faculty with which the Dutch expressed themselves in this language astounded the visitors.

Five technical papers were presented during two sessions, on "Throwing and Covering Power in Electroplating Solutions" by Dr. de Bruijn; "Recent Developments in Tin and Tin Alloy Plating" by Dr. J. W. Cuthbertson; "Modern Technique and the Electrolyte" by Dr. P. Baeyens; "Plating Rectifiers" by Mr. R. van Rossum; and "Electrical Measuring Instruments" by Dr. A. Classen.

There was also an inspection of the new metal-finishing plant at the Phillips electrical works in Eindhoven, which permitted a comparison between Dutch and British practice.

Several social affairs and a sight-seeing trip through Amsterdam and the countryside further cemented the friendship between platers from the two countries.

Electroplating Scholarships. Fulton Asphalt Company, Chicago, Ill., has made available two scholarships in Electroplating-Know-How, the home-study course offered by the Joseph B. Kushner Electroplating School, Stroudsburg, Pa.

As announced in an advertisement in this issue, these scholarships are won by contest. The contest rules are as follows:

1. At the top of a sheet of white 8½ x 11 paper, print your name, address, present occupation and company affiliation.

2. Fold over the top edge of the paper so that this data is not visible. Hold fold in place with a small piece of Scotch Tape.

3. Starting above the center of the page, using ink or typewriting, complete with fifty words or less, the following statement:

"Electroplaters should be able to *think* plating as well as do plating, because . . ."

4. Submit this statement by mail to Electroplating Scholarship Contest, Box 230, Stroudsburg, Pa.

5. This Scholarship Contest is open effective immediately and ends midnight May 20, 1951.

6. Based on the decision of the judges, which will be final, the persons submitting the two best statements will be awarded the scholarships.

7. Statements will be judged on the basis of sincerity, integrity and originality of thought. Fancy rhetoric will not count.

8. Contest winners agree to abide by the School Regulations in accepting the scholarships.

9. All statements submitted become the property of the Joseph B. Kushner Electroplating School, and none will be returned.

10. The scholarship winners will be announced publicly as soon as feasible after the close of the contest. Those entrants who wish to be informed directly must enclose with their entry a self-addressed and stamped return envelope.

For a complete description of the home-study course, Electroplating-Know-How, and ideas that will help in formulating your statement, write to the contest address given under Rule No. 4.

Wyandotte Research. Construction of a new research center and expansion of the research and development activities of Wyandotte Chemicals Corporation, a major producer of industrial chemicals and cleaning products, has been announced by Robert B. Semple, President.

The new Research Center will be housed in a functionally engineered two-story structure of modern architectural design, a city-block long and a half block wide, to be constructed immediately near the company's administration building in Wyandotte. It will operate under the general direction of Dr. Thomas H. Vaughn, Vice-President in charge of research and development. Occupancy is scheduled for mid-1952.

Work in the new center will be concerned with research investigations, among others in the fields of atomic tracers,

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BLAKESLEE
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DEGREASERS
USE LESS SOLVENT
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Stabilized Degreasing Solvent — one price, one solvent for all metals
NIAGARA
Metal Parts Washers for use with cleaning compounds on either batch or production jobs.
Blakeslee Solvent Vapor Degreasers USE LESS SOLVENT because of the patented construction and operational features. Metal parts are made chemically clean and dry in just a few seconds. Save time, labor, rejects with a Blakeslee Solvent Vapor Degreaser. A Blakeslee engineer-trained representative is available to solve your specific degreasing problems.
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1844 S. 52nd Avenue • Chicago 50, Illinois
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Dump your Cadmium Problems

in the WAGNER LAP

We're set up to relieve you in *FIVE IMPORTANT WAYS!*

Your cadmium plating problems may be with you right now—or they may be just around the corner. Perhaps you're converting from a 'peace time' finish—maybe you're starting on a new defense product which specifies cadmium. Whatever your situation, experienced with cadmium or not, we can help you. For example—

PROBLEM No. 1—Restrictions: If you're all bound up in red tape, can't unravel the latest from Washington, we'll gladly give counsel, the consensus of industry's thinking, interpretations—many right from the mouth of the horse.

PROBLEM No. 2—Metal: We offer you a reliable, *primary* anode source—and Wabrite cadmium, the pure, smooth, bright cadmium ball you can't mistake for any other metal. If your order is rated, we'll ship cadmium till the world looks level.

PROBLEM No. 3—Supplies: We'll start you off right—with our cadmium solution, Wabrite M3X, a three-times concentrated electrolyte, mixed, filtered, purified, plus our proprietary compound.

PROBLEM No. 4—Equipment: We're ready and qualified to set up your complete plating department or any part of it—from tanks, degreasers, rectifiers, barrels, racks to a modern, automatic plating system.

PROBLEM No. 5—Production: Our field engineers are *plating men,* ready to pitch in, keep you going at top efficiency. Our experimental laboratory, pilot plating plant and skilled technicians and metallurgists are at your service.

Get rid of your plating headache! Put in a call to us and we'll have our nearest field engineer rapping on your door. Use the coupon, if you prefer; either way will get sudden action.

Wagner BROTHERS INC.

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I have cadmium plating problems.

☐ **Phone me immediately or** ☐ **Have representative call.**

Name_____ **Title**_____

Firm_____

Address_____

City_____ **Zone**____ **State**_____

Industry News

physics, electronics, organic and inorganic chemistry, and detergency in the industrial and metal-cleaning fields.

Wright Aeronautical Corporation is now signing up qualified subcontractors on huge government orders for aircraft engines in which Wright is prime contractor. Those of our readers who would welcome such a contract should contact the company at Main and Passaic Sts., Wood-Ridge, N. J.

Hot Dip Galvanizers to Meet. American Hot Dip Galvanizers Association, Inc., has scheduled its 16th Annual Meeting to be held in Atlanta, Ga., with headquarters in the Biltmore Hotel on March 21–22.

An outstanding feature will be a trip through the plant of Atlantic Steel Company, with which Association President R. E. Byrd is connected. Other highlights will be delivery of technical papers, the unique Problems Clinic Session, discussion of plans for the year ahead, and a review of current conditions and their effect on the industry. The majority of the sixty some members are expected to attend.

Chemco Products Company, Inc., Lyons, Ill., has changed its name to **Pelron Corporation.** The management, personnel and location will remain the same.

Pelron manufactures such industrial chemicals as metal cutting and grinding compounds, metal cleaners, paint strippers, and phosphating compounds.

Bellows Broadens Pacific Coast Activities. Establishment of West Coast Regional Headquarters at 733 E. Pico Blvd., Los Angeles, has been announced by The Bellows Company, Akron, Ohio, manufacturers of Bellows "Controlled-Air-Power" devices. George Cook, formerly of Conapco, Inc., will act as Regional Manager and will direct the sales and service activities in the industrial areas of Los Angeles, San Francisco, Spokane, Portland and Seattle.

The company will take over all distribution sales activities for **Smith-Johnson Corporation,** Los Angeles, manufacturers of Senacon pneumatic equipment, formerly handled by **Conapco, Inc.**

Protect them with M & W Clear Coatings that stand 800 HOURS OF SALT SPRAY!

● Zinc die castings and zinc plated steel are being used more and more as big manufacturers swing to these parts to replace unavailable materials. BUT the copper, nickel and chromium normally used for plating are in tight supply *too.*

Here's an effective way to meet this new problem. *Coat the die castings and zinc plated steel parts—instead of plating them!* Coat them with the M & W finishes that stand up under salt spray and weatherometer tests for the extraordinary period of 800 hours . . . that protect the zinc against discoloration!

PIONEERS IN PROTECTION — 75th ANNIVERSARY — M&W CO. 1870

Use DULAC Clear Universal Lacquer #462 if you want an air-drying lacquer—CODUR Clear Synthetic Y743 for baking. They both give the same exceptional performance. Write for free Technical Data Bulletin #110, or let our M & W technical consultants discuss your requirements with you.

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Thoroughly experienced in all types of electroplating processes and control. Also metal cleaners and buffing compositions.
Ferrous and non-ferrous metallurgy, lacquers, enamels, detergents, and specialties.
Formulations, development, and technical service experience. Available full time or consulting. Excellent references. *Reply to:*

P-351–A, PLATING
P. O Box 168, Jenkintown, Pa.

WANTED

Chemist or Chemical Engineer, 26 to 40, with Electroplating experience, to perform experimental and developmental research in Electroplating. Good opportunity with established company in the Pittsburgh area. Please reply in detail:

P-351-B, PLATING
P. O. Box 168, Jenkintown, Pa.

WANTED

Electrogalvanizing Department Superintendent for Ohio Strip Steel Plant. State qualifications and furnish employment resume together with desired salary.

Reply to:
P-351-C, PLATING
P. O. Box 168, Jenkintown, Pa.

REAL SALES OPPORTUNITY

Here's a real opportunity for aggressive men to earn more money. Well established basic chemical manufacturer has openings for outstanding sales representatives in the following territories . . . Philadelphia-Baltimore, Indiana-Southern Ohio, Wisconsin-Minnesota, and St. Louis and Southern Illinois. Complete line of alkaline and solvent emulsion type metal cleaners. Knowledge of metal finishing, plating, etc., essential. Prefer men with selling experience. Cars furnished. State age, previous experience, other qualifications. All replies will be held strictly confidential. *Write*

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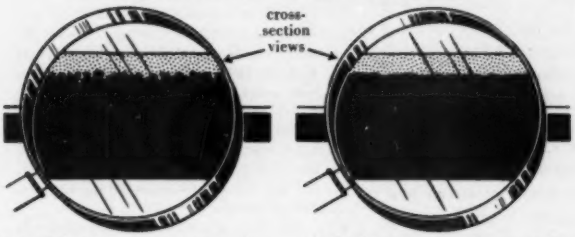
RACK COATINGS that are bonded RIGHT

The bond is stronger than the coating itself . . . just try to pull the coating from a rack that has been sandblasted.

Another reason why BELKE Racks Cost Less to Use

BELKE-Developed Processes bond the coating to the metal with a bond that is stronger than the coating itself. The BELKE Bond is not weakened by continuous temperature changes and flexing of tips. It provides unequalled protection against seepage between coating and metal.

It takes *SANDBLASTING* to Make a GOOD BOND



Sandblasting produces irregular surfaces with deep recesses—the ideal foundation for a strong bond between metal and coating — free from unbonded spots to cause blisters.

Acid Dipping produces relatively smooth surfaces with shallow recesses — a poor foundation for bonding coating to metal. Spots of poor adhesion are practically unavoidable.

RESULTS TALK!—First pull the coating from an acid dipped rack . . . then just try to pull the coating from a BELKE Rack. You'll see why BELKE Racks cost less to use.

Sandblasting is just one of the extra quality features that makes possible the longer service life you get with BELKE Coatings.

For quotation on coating or making racks, just send sample rack or dimensional print with complete information . . . or consult a BELKE Service Engineer.

BELKE Spines and Tips are coated separately. Patented Vac-Seal Design joins tips to spine with leakproof seal, yet tips are readily removable.

most complete RACK MANUAL ever produced

Dozens of Hot Items

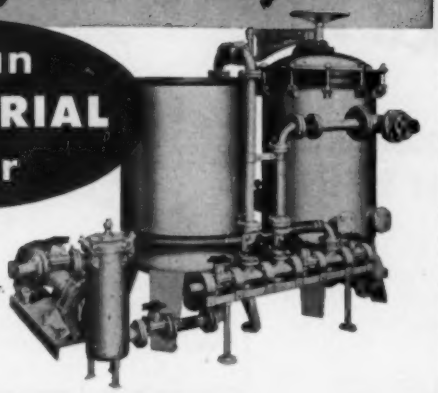
100 pages. 560 Proven Designs of Racks, Tips and Hooks. Shows how to rack everything from jewelry to bumper bars. Price $5.00 post paid.

Belke MANUFACTURING CO.
947 N. Cicero Ave.
Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

For Any Plating Solution
Any Quantity

use an **INDUSTRIAL** Filter



100 to 15,000 gallons per hour. Portable and stationary models. Standard or special filtration systems engineered to meet unusual requirements.

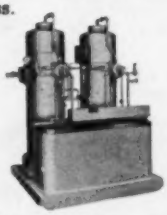
You save many ways . . .

Here's how Industrial filters keep down the cost of plating jobs—The flow rates of Industrial filters are based on the actual plating solutions involved. You know the capacity you get. In the filtration of plating solutions there is more than just the filter. With Industrial you get an adequate filter with slurry tank, motor driven pump, valves and fittings in a complete package with one, undivided, experienced responsibility—with space requirements at a minimum.

The labor, down time, and the inconveniences of cleaning, replacing the filter media, and reassembling the filter for every new filter cycle—all are eliminated by the Industrial Air-Wash Cleaning Method available for all models. It is necessary to remove the cover only when new filter cloths are installed. With Industrial filters, a clarified plating solution is always assured.

The engineering, design, and construction of Industrial filters have proved out in long service and low maintenance costs. Industrial has the experience and is large enough to handle your filter requirements. Since 1927 filters and filtration systems have been an important part of our business.

INDUSTRIAL Water Demineralizers



A Two-Bed INDUSTRIAL Water Demineralizer. Standard two-and four-bed units available with capacities of 200 to 1000 gph. Special units of any capacity engineered to requirements.

for **No stains after hot rinse. No unwanted precipitates in solutions.**

Write for full information and recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

5914 Ogden Ave.
Chicago 50, Illinois

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

Personals

W. I. Tebo has been appointed Washington Engineering Consultant and Technical Advisor to the Detrex Corporation, Detroit 32, Mich.

Tebo

During his nineteen years of company service he has had laboratory, engineering and field experience in every phase of industrial metal cleaning. He will make his headquarters at the Shoreham Hotel.

Donald F. Deakin has joined the Atlas Mineral Products Company, Mertztown, Pa., as Water and Sewer Products Director. He is a graduate of Penn State with a degree in civil engineering. **Newton O. Duncan, Jr.,** a recent graduate of Texas A. & M. College, has joined Atlas and has been assigned to the Houston office.

Howard H. Blouch has been appointed Sales Manager of the Cleveland plant of the Chromium Corporation of America. He will succeed **Charles McKinley** who died in October.

Mr. Blouch has had wide experience in the plating industry during twenty years with the Electroplating Division of E. I. duPont de Nemours Company, two years as Process Engineer with the Van der Horst Corporation, and the last four years as Western Sales Manager of the Heil Process Equipment Corporation.

Elmer A. Lord has been promoted to Sales Promotion Manager of the Cowles Chemical Company, Cleveland, Ohio. In charge of the Company's advertising, he

Lord

fills the position held for the past five years by **James A. Barnes** who is leaving Cowles to become editor of *Starchroom Laundry Journal.*

A native of Cleveland, Mr. Lord was graduated from Western Reserve University in 1947. Since that time, he has been

How Manning, Bowman & Co. gets efficient cleaning prior to nickel and chrome plating

PENNSALT CLEANERS prove superior in rigid comparison tests

Plating on household appliances must not only be bright—for the sake of sales appeal . . . but it must also adhere tightly—to prevent it from peeling under extreme heat and humidity encountered in use. This necessitates efficient cleaning prior to plating. And that's where Pennsalt metal cleaners get a chance to show their worth.

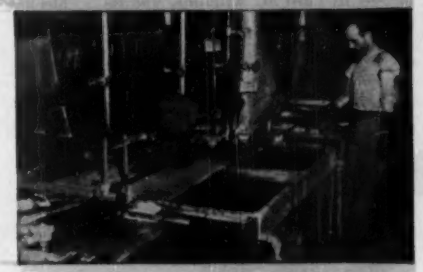
Recently, at the Manning, Bowman & Co. plant in Meriden, Conn., rigid tests were run to determine which cleaner would permit the best plating. The general plating foreman, an expert from 'way back, was after just one thing: *results*.

Various articles, both ferrous and non-ferrous, were sent through two parallel lines. One used Pennsalt® Z-54, the other used competitive cleaners. The tests proved Z-54 definitely superior in actual performance, and more economical per unit cleaned. Z-54 lasted much longer . . . with practically no rejects due to spotting or "color." Now Manning, Bowman is 100% sold on Pennsalt metal cleaners.

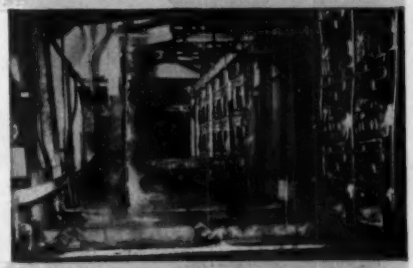
ONE BIG REASON why Pennsalt cleaners do such a consistently good job is this: as a *basic* producer, Pennsalt controls the manufacture of its products from raw material to finished form. This controlled manufacture—backed by intensive research—results in higher quality at lower cost to *you*.

Call in your Pennsalt representative. He'll be glad to study your present cleaning method, and possibly show you savings in time and money. Or write to: Special Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

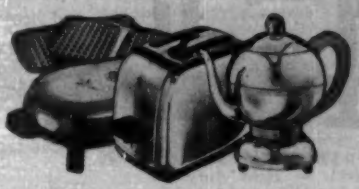
After buffing, percolator body enters first Pennsalt Z-54 bath. (Cathodic electroclean, 6 oz. of cleaner per gal., 6 volts, 20 seconds.) Hand line used for hollow-ware.



After rinse and pickle, work enters second Z-54 bath for reverse cleaning. (Anodic, 6 oz. per gal., 6 volts, 5 to 10 seconds.)



After nickel plating, work enters automatic chrome line. Tops of waffle irons are shown entering Pennsalt cleaner bath.



PENNSALT helps Manning, Bowman produce these brilliant household appliances.

PENN SALT

PROGRESSIVE CHEMISTRY FOR OVER A CENTURY

There's a Pennsalt Cleaner for every metal cleaning operation

Personals

employed with Cowles in both the Production and Sales Departments.

Royal F. Clark of Newark, N. J., celebrates his fiftieth year of active plating. For a number of years he has specialized in rhodium and palladium plating. He is a member of the Newark Branch of the American Electroplaters' Society.

Paul F. Pié, Jr., has been appointed superintendent of the Marshall, Texas, Activated Carbon Plant of the Darco Department, Atlas Powder Company, to succeed **Richard M. Williams,** who retires on March 1.

Mr. Pié joined Atlas in 1932 after graduating from the University of Delaware in chemical engineering. In 1942, following several years in the Darco Research Laboratory, he went to Kentucky Ordnance Works, a TNT operation managed for the United States Government by Atlas. He returned to Marshall in 1945 as Assistant Superintendent. Mr. Williams has been thirty-three years with Atlas and Darco. He has recently been on leave of absence due to ill health.

Nicholas M. DuChemin of Lynn Field, Mass., has been named General Manager of the Small Apparatus Divisions of the General Electric Company's Apparatus Department. These divisions include among others the Control Divisions, Lighting and Rectifier Divisions, Meter and Instrument Divisions, and Small and Medium Motor Divisions.

Mr. DuChemin, a native of New York City, is a graduate of St. Bonaventure's College, Newfoundland, and also has had special courses at Boston University, Harvard, and Suffolk Law School, Boston. He entered G. E. in 1914 at Lynn River Works and held a variety of positions within the company until he was made an Assistant General Manager of the Apparatus Department.

Raymond F. Hart is now Assistant to the President, and **A. E. Kromer** Trade Sales Division Chief Chemist of the Standard Varnish Works, New York, N. Y.

Mr. Hart has wide experience in the analysis of organizations and methods,

Hart **Kromer**

having served both private businesses and various government agencies. During World War II he was Chief of The Production Requirements Plan of The War Production Board and later, as a Lieutenant, performed contracting and expediting duties for the Navy. A graduate of the University of Florida and active in color-chemistry for more than twenty-three years, Mr. Kromer has held positions with several outstanding manufacturers of paints, varnishes, and enamels.

Clyde C. Kelly is now Assistant to the President of B. Mercil & Sons Plating Company, Chicago. He is the chairman

Kelly

of the Industrial Finishing Exposition to be held in Chicago in conjunction with the A. E. S. 1952 Convention.

John M. Davidson is now Philadelphia District Manager for the Special Chemicals Department of Pennsylvania Salt Manufacturing Company. He replaces **Horace F. McIntyre** who was recently appointed Product Supervisor of the department.

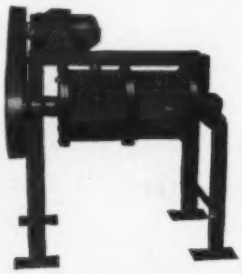
Russell C. Fancher and **Harold Gervais** have recently joined the industrial staff of the Detroit district of Wyandotte Chemicals Corporation.

Mr. Fancher has been a member of the research, development or sales staffs of

ON SMALL JOB LOTS

FINISHING COSTS TUMBLE

TILT-TYPE BENCH MODEL — motor or belt driven. Adjustable elevation. Steel, wood, rubber lined or alloy metal barrels.



HORIZONTAL FLOOR MODEL — light duty for bulk tumbling and burnishing of small parts.

. . . . when you use a Henderson Oblique Tilt-type Bench Model Tumbling Barrel.

Ideal for SMALL-LOT FINISHING and SAMPLE LOT PRODUCTION of jewelry, clock parts and similar products requiring a *quality finish at minimum cost.* Widely used in laboratory experimental work.

ALSO HORIZONTAL TUMBLING BARRELS — both light and heavy duty for small-lot and quantity production.

Tumbling barrels for every purpose or, made to order to meet your special requirements.

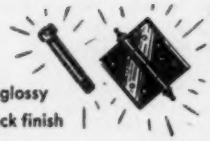
Write now for further information

Since 1880 Designers and Builders of Tumbling Barrel Equipment.

THE HENDERSON BROS. COMPANY

137 SOUTH LEONARD ST. WATERBURY 85, CONN.

News about UNICHROME Trade Mark COATINGS for METALS



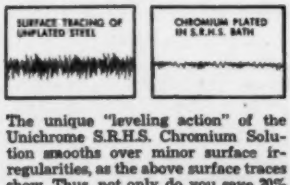
New dip produces glossy dense black finish

Newly developed Unichrome Dip for zinc offers you an unusual, dense black *metallic* finish that has all the appearance of black *enamel*. It has a uniform depth of color, good gloss. It increases the rust resistance of zinc plated steel and withstands a fair amount of wear. Suggested uses: As an attractive product finish to cut costs; as a corrosion inhibiting finish; as a *quality* replacement for black nickel. Write for more information. NOTE: Available in uniform olive drab, too.

How to get more life from lead anodes in chromium plating

Use 93% lead-7% tin Unichrome Anodes for longer anode life. This alloy provides extra resistance to chromic acid during both operating and idle periods. In addition, by using anodes at least ½-inch thick, you reduce heating effect of current. Cooler anodes *also* last longer, save additional money.

Hard chromium plated SMOOTHER as well as *faster*



The unique "leveling action" of the Unichrome S.R.H.S. Chromium Solution smooths over minor surface irregularities, as the above surface traces show. Thus, not only do you save 20% to 80% plating time with this high speed bath, but also require less finishing of the plate.

BRIGHT FINISHING IS NO PROBLEM

with this Unichrome Dip Finish for zinc

Having trouble getting materials for bright finishing? Then consider this: Zinc processed in Unichrome Clear Dip equals more costly and scarcer finishes in sales winning appearance.

It also goes further. (You need deposit only .0003" of zinc to produce this finish). Furthermore, it has superior rust resistance, which is fortified by the corrosion protection of Unichrome Dip. And even if you could get all the finishing materials you need, the Unichrome Dip Finish still would be your best bet for *economy*.

ECONOMICAL CHROMATE-TREATING, TOO

In money-saving dilutions, Unichrome Dip provides a yellow, chromate finish. By switching to this from the "home made" solution formerly used for die castings, a large automotive supplier not only saved 50% on material costs alone, but also gained helpful "U.C." finishing service.

A chemical treatment, the Unichrome Dip process produces its finish integral with the zinc in 5 to 20 seconds. The solution is easily controlled and adapted for long use in manual or automatic equipment. The finish is an excellent base for lacquers and synthetics. In fact, Unichrome Clear Dip Finish topped with a Unichrome Clear Organic Coating is being adopted by companies as today's best way to still give customers a finish with high grade brightness and great lasting quality.

Scarcities or not, it will pay you to have all the facts on Unichrome Dip. Write us today. Remember, when it's a question of finishing metals, you can always count on "Coatings for Metals Headquarters" for help.

UNICHROME Trade Mark

UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.

Personals

Packard Motor Car Company, Federal Mogul Corporation, and Eaton Chemical & Dyestuff Company. Mr. Gervais has performed chemical, metallurgical and sales duties for Ford Motor, Continental Aviation and Engineering, and International Detrola. Both have special metal-finishing schooling with the Wyandotte Technical Service and Research Departments.

Detroit and home-office Wyandotte men honored **Charles R. Beaubien,** who joined Wyandotte in 1923, with a testimonial dinner held upon his pension retirement.

Left to right: Fancher and Gervais, Larry Glynn, Beaubien, Tom McCormick, Detroit Manager; Robert Racine, Technical Service Department; and Dr. Roy E. Heath, Manager Market Development, Industrial Detergents

A. L. Geisinger has been appointed to a vice-presidency in Diamond Alkali Company and will have charge of Diamond's activity in the organic-chemistry field. He is also President of the Martin Dennis Company, Newark, N. J., one of Diamond's divisions.

After receiving a degree in mechanical engineering from Ohio State University in 1914, he became associated with Philadelphia Quartz Company, Philadelphia, Pa. In December, 1919, he joined Diamond Alkali, launching a service record now exceeding thirty years.

Ralph Pettit is now Vice-President in charge of production of Chicago Thrift-Etching Corporation. He was formerly with Aluminum Company of America, in charge of anodic finishes.

Richard T. "Dick" Barnes, Jr., was recently named West Coast representative of Tumb-L-Matic, Inc. His headquarters will be San Francisco, with the mail address P. O. Box 227, telephone Sutter 1-4425. Mr. Barnes graduated from M. I. T. in 1930. He was formerly employed by the Plastics Division of Monsanto Chemical Company and the International Nickel Company.

Barnes

George A. Gibbs, formerly with Keystone Watch Company, Riverside, N. J., is now with the Bulova Watch Company, Providence, R. I., in charge of the plant laboratory. He has been First Vice-President of the Philadelphia Branch of the American Electroplaters' Society.

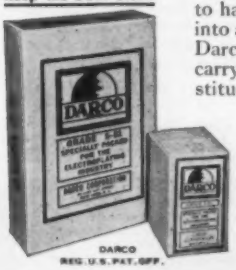
Start Clean... Stay Clean!

Mom's smart—and a good example for the plater. Actually, it's wasteful—and expensive—to prepare work for plating then put the clean metal into a bath of questionable purity!

Start clean . . . *stay* clean! Red Label Darco S-51 adsorbs in its pores the impurities that cause trouble in plating baths . . . takes them out of the bath before they can be deposited on the freshly cleaned surface of your work.

Red Label Darco helps you save on scarce anode metals . . . helps you do a better job with thinner deposits and minimize rejects.

With clean metal... keep the Bath Clean



Red Label Darco S-51 is especially treated for use in plating—the only carbon that meets the benzol-mercury test! It is especially easy to handle . . . easy to wet . . . easy to make into a slurry. Place your order for Red Label Darco S-51 today. Practically all suppliers carry Darco in stock, so don't accept substitutes.

DARCO DEPARTMENT
ATLAS POWDER COMPANY
Darco General Sales Offices
60 East 42nd Street, New York 17, N. Y.

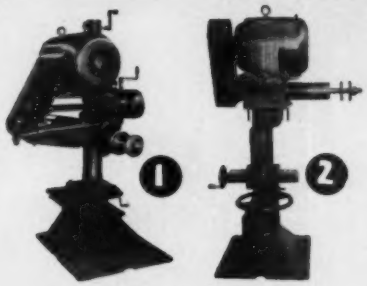
WANTED

Manufacturer's Agents in certain areas to sell McKEON'S "ZINC BRITE," world's most effective cleansing and purifying agent for cyanide zinc plating solutions. Liberal commission. Excellent cooperation. *Write:*

SULPHUR PRODUCTS CO.
Greensburg 8, Pa.

FOR HIGH PRODUCTION POLISHING and BUFFING

ACME Automatic POLISHING and BUFFING MACHINES



ACME Polishing and Buffing LATHES

Developed from years of experience and successful application to hundreds of polishing and buffing machine arrangements, ACME Adjustable Floating Head Polishing and Buffing lathes have a record of dependable performance under production conditions.

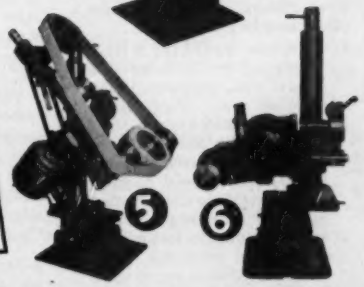
Used in conjunction with ACME Automatics, Rotary, Straight-line, Semi-Automatic and Special polishing and buffing machines, they have proved their leadership for years.

1—ACME Type G-1 Heavy Duty Adjustable Polishing and Buffing lathe. Up to 20 H.P. also furnished in Standard type up to 7½ H.P.

2—ACME Type L-8-L Buffing Head. Vertical and cross slide adjustment, angle and tilt adjustment. Up to 10 H.P.

3—ACME Heavy Duty Adjustable Double Float Polishing and Buffing Lathe. Horizontal and vertical adjustment. Up to 20 H.P.

ROTARY STRAIGHT LINE SEMI-AUTOMATIC AND SPECIAL *Polishing and Buffing Machinery*



4—ACME Type G-3 Heavy Duty Adjustable Floating Head Polishing and Buffing lathe. Up to 15 H.P.

5—ACME Type G-3 Adjustable Polishing Belt Head Lathe with floating back-up wheel.

6—ACME Standard Type G-3 Adjustable Floating Head Polishing and Buffing lathe. Up to 7½ H.P.

(Catalogs on Request)

SPECIAL MACHINERY AMC AUTOMATIC BUFFING MACHINES

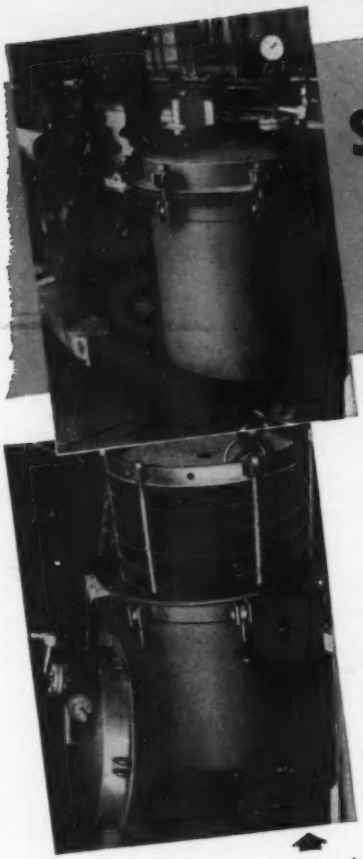
ACME Manufacturing Co.

1645 HOWARD ST. DETROIT 16, MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 187.

No repairs or maintenance in over 17,000 hours of 'round-the-clock operation



The kind of service Sparkler Horizontal Plate Filters have given the Gillette Safety Razor Company—efficient and trouble-free, even under most extreme conditions—is the kind of service that is vital to *every* filtering operation.

For example: A rubber-lined Sparkler Model 8-18 filter is used by Gillette in the continuous filtration of a 1000-gallon bright nickel plating solution. Now operating for approximately two years, this filter has been on a 24 hours a day, 7 days a week schedule — without any loss of operating time for repairs or maintenance. Also used in periodic batch carbon treatments of nickel solutions this unit, according to Gillette technicians, consistently delivers a brilliantly clear effluent, even though the plates may be packed solid.

Another Sparkler Filter employed by Gillette is a Model 8-6, stainless steel, portable unit. Used exclusively for cyanide type plating solutions, this Model 8-6 has proved particularly valuable for Gillette's gold plating operations since the patented Sparkler Scavenger Plate assures minimum loss of precious gold solution. Now operating almost six months for at least 2 hours daily, its performance has been satisfactory in every respect.

Top: Sparkler Model 8-18 filter shown installed in Gillette's plating department. Above: Same filter, with filter plate assembly being removed for cleaning

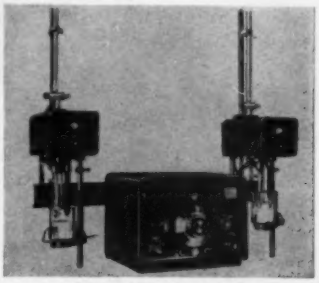
Left: Sparkler Model 8-6 stainless steel filter. This portable unit is used by Gillette to filter gold plating solutions.

Our Engineering Department (with more than 25 years' experience in every phase of filtration) is available for consultation without charge.

SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

Trade Literature

L—560. Automatic Titrator—Beckman Instruments, Inc., Pasadena, Calif., has announced The Beckman Automatic Titrator. This new electrometric instrument handles routine titrations completely automatically, thus releasing the laboratory technician from the strain and monotony of manual titrations and permitting him more time for preparing samples and calculating results. Reproducible results free of errors due to personal factors are obtained.



In a series of titrations it is only necessary to fill the burette and place the sample in the beaker. Raising the beaker holder into position automatically starts the stirrer motor and begins delivering titrating solution into the sample. The unique circuit electrically anticipates the approaching end point, scaling down delivery of the titrating solution to assure a highly accurate titration. When the end point is reached, delivery of the titrating solution automatically stops and a light shows completion of the titration.

Neutralization, oxidation-reduction, precipitation, complex-formation and other types of titrations can be performed. As many as four delivery units can be accommodated by a single amplifier control unit.

The Titrator can also be used as an acpowered *p*H meter to give accurate reading over the range 0 to 14 *p*H and to provide millivolt readings over the range from −600 to +1400 mv. A bulletin describing this instument in detail is available. For your copy, use Reader Service Card.

L—561. Tong Test Ammeters—Columbia Electric Manufacturing Company, 4519 Hamilton Ave., N. E., Cleveland 14, Ohio, offers an 8-page illustrated bulletin describing the Tong Test, a unique instrument that can be used to measure current in both a-c and d-c lines. Readings are taken easily and quickly by merely shaping the tongs around the electrical conductor. It is not necessary to break the circuit or insulation. Voltage readings can be taken with the Voltor voltage

Flexible and More Precise

THAN WITH HARD BURRS

Do cast or stamped parts you are finishing come to you with slivers, fins, rough edges, plugged holes, imperfect corners?

Look into the Lea Burring Method for fast and precise removal of such excess metal and straightening out of edges and surfaces. This method while used to some extent prior to World War II really came into its own when manufacturers were faced with really stiff specifications and close tolerances. The Lea Method helped many a company stay in war-contract business.

Since the war many companies retained the Lea Method of Burring in order to maintain high finishing standards. Now, there is an increasing demand for better preparation of surfaces on which finishing operations are to be performed. Now—as before—Lea is the method being adopted for removing burrs.

Our technical staff will be glad to help you make use of this proved method. Write in detail and, if possible, send us samples of pieces to be deburred for our recommendations.

Burring, Buffing and Polishing Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.
LEA MFG. COMPANY OF CANADA, LTD.
370 Victoria Street, Toronto 2, Canada

Manufacturers of Lea Compound and Learok, Industry's Quality Buffing Compounds for over Twenty-Five Years

Trade Literature

attachment. Details of features, types and ranges, accuracy, and prices are given in the bulletin. For your copy, use Reader Service Card.

L—562. Quality Control Manual—The 1951 "Manual on Quality Control of Materials", STP 15-C, issued by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., after extensive work by leading authorities who serve on A. S. T. M. Committee E-11, replaces the former widely distributed report on "Presentation of Data". The Manual presents up-to-date information on statistical methods and quality control methods and makes recommendations for their application in engineering work. Part 1 discusses the application of statistical methods in condensing information in a set of observations and presenting it in concise form. Part 2 is on the problem of presenting limits to indicate the uncertainty of the average X of a sample of n observations and suggests a form of presentation for use. Part 3 covers the control-chart method of analysis of data from several samples and gives a criterion for noting lack of statistical control. This part is useful in setting up a program for controlling quality. 100 pages, paper cover, $1.75 (to A. S. T. M. members, $1.35).

L—563. Rapid Methods for the Identification of Metals—Increasing interest in recent years, and the development and wider use of spot tests and other rapid methods of identifying metals, led A. S. T. M. Committee E-3 on Chemical Analysis of Metals to elicit technical papers and discussions from leading authorities which resulted in this symposium published under the aforesaid title, STP 98, by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. The publication covers: Development, Present State, and Outlook of Spot Test Analysis (Feigl, Brazil); Electro Spot Testing and Electrography (Hermance and Wadlow, Bell Laboratories); Instruments for Rapid Metal Identification (Webster, Jones & Laughlin); Separating Alloys by Relative Spot Tests (Kirtchik, G. E.); Identification of Copper-Base Alloys (Nevers, American Brass); Metal Finishes (Lewis and Evans, Western Electric); Plated and Protective Coatings by Electrographic Analysis (Galitzine and Ashley, G. E.); A Field Test Kit for Nickel Alloys and Stainless Steels (Lea, Eastman-Kodak); Identifying Alloy Steel (Kirkham, Utah Experiment Station). 84 pages, paper cover, $1.75 (to A. S. T. M. members, $1.35).

L—564. Drum Lining—Gates Engineering Company, P. O. Box 1711, Wilmington, Del., offers a catalogue sheet describing its Gaco drum-lining material, a pure vinyl compound. Flexibility and adhesion, as well as chemical resistance and abrasion resistance, are properties claimed for the lining. Details of application are shown. For your copy, use Reader Service Card.

L—565. Tramrail—An illustrated 4-page bulletin describing the Ohio Tramrail line of cranes, transfer bridges and tramrail systems is announced by The Forker Corporation, 2044 Random Rd., Cleveland 6, Ohio. It shows numerous installation photographs and parts details, carries a complete story on the Ohio Tramrail Shielded Electrification System, and features such component details as cross-sections of Ohio Teenail track, and the recently augmented line of Ohio Beamrail track which are now available in twelve different sizes.

Available along with the new bulletin are specification-detail sheets which enable the methods or lay-out engineer to figure his plant's rolling live loads, weights, and spans needed to compute and specify his own tramrail or crane installation. For your copy, use Reader Service Card.

L—566. Tank Linings—The Atlas Mineral Products Company, 42 Walnut St., Mertztown, Pa., announces the publication of its new Corrosion Proof Linings Bulletin No. 4-1. This bulletin describes Atlas' complete line of corrosion proof linings, including sheet linings, solution or dispersion linings, brick sheathings, and miscellaneous linings. For your copy, use Reader Service Card.

L—567. Tin-Zinc Alloy Plating—This substitute for cadmium is explained in Technical Data Sheet No. 106 issued by Metal & Thermit Corporation, 100 E. 42nd St., New York 17, N. Y. Complete information on the plating solution, anodes, equipment, control, advantages and disadvantages of the method are in-

From the developers of

IRIDITE®

ARP BRIGHTENERS for ZINC and CADMIUM PLATING

Bright plating troubles go down the drain when you specify ARP Brighteners for zinc or cadmium solutions in barrel, still or automatic equipment! Three trouble-free, efficient formulae, developed in Allied Research laboratories, are available to help you consistently produce a fine grained, clear and sparkling-bright plate:

1. For lowest cost operation of zinc plating without subsequent bright dipping or passivation! Increases solution efficiency to as high as 98% in low current densities. Produces a clear bright plate with a blue chrome-type cast.

2. For zinc plating followed by bright dipping or chromate passivation with Iridite! Lowest cost at high current densities. Yields a plate with a yellow nickel-type cast.

3. For cadmium plating. Produces a silvery bright deposit at any current density.

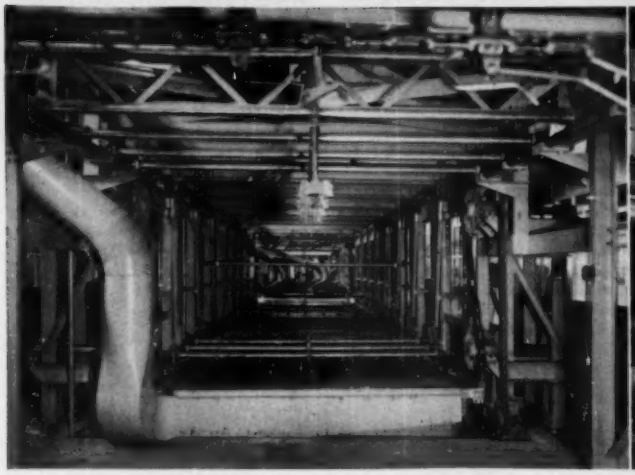
All three ARP Brighteners offer you many operating advantages including: better throwing power, increased solution efficiency, more efficient metal consumption, uniform coverage, reduced rejects, lower operating costs, higher quality work, ease of use.

INVESTIGATE TODAY! Ask your Iridite representative for full information or write direct. Mention type of plate desired and equipment used in your shop.

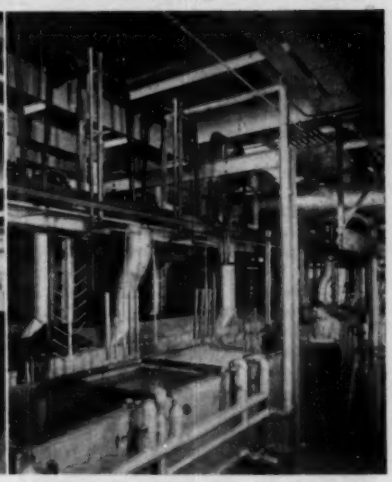
Manufacturers of Iridite finishes for corrosion resistance and paint systems on non-ferrous metals; ARP plating chemicals

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

In your plating *How to Get* Greater Production Improved Quality Better Working Conditions

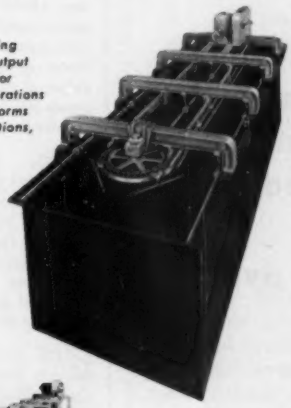


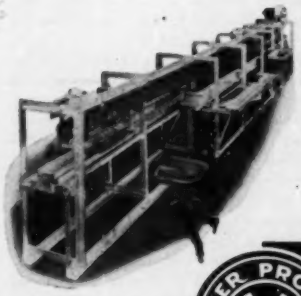
Typical Meaker Straight-A-Way Automatic Plating Machine. This type unit is designed to handle 125 racks or more per hour.



Meaker Return-Type Automatic Plating Machine for chromium-plating the large variety of parts in a high-quality line of plumbing hardware. Machine may be designed to copper plate, nickel plate and chromium plate in one continuous line.

A Meaker Semi-Automatic Plating Machine for use in medium-output plating departments and also for supplementing the plating operations in a Full Automatic which performs the cleaning, preplating operations, final rinsing and drying.





A special machine designed by Meaker for cleaning and silver plating small, brass contact clips.

You Get All Three with Meaker

Here's how! A Meaker plating machine makes every operation in the plating sequence automatic, or as mechanized as possible. This cuts to a minimum the manual handling of the parts in process—increasing production. The control of the quality of the plating is set and practically independent of the varying human element. A Meaker plating machine does clean up the plating room making for safer and more agreeable working conditions. And a bonus—in many cases the savings in the over-all plating costs have paid for the equipment in a short time.

Look to the handling methods in your plating department. You might be surprised what modern methods will accomplish. Whatever your requirements—full automatic, semi-automatic, or a special machine—Meaker has the answer.

MEAKER PRODUCTS

Serving the Plating Industry for Over 50 Years

THE MEAKER COMPANY

1639 South 55th Avenue, Chicago 50, Ill. • Telephone Bishop 2-1920

Trade Literature

cluded. For your copy, use Reader Service Card.

L—568. Reversing Switch—The Columbia Electric Manufacturing Company, 4535 Hamilton Ave. N. E., Cleveland 14, Ohio, has prepared Section 550 which describes and illustrates the Columbia reversing switch, designed to fill the need for a compact, low-voltage, high-current unit for use in electroplating. For your copy, use Reader Service Card.

L—569. Plastic Pipe—Johnson Plastic Corporation, Brown Rd., Chagrin Falls, Ohio, has published an 8-page catalog on Johnsonite Plastic Pipe, the flexible pipe which is said to be 13 times lighter than ordinary pipe, yet last for thirty years.

Amply illustrated, the catalog gives information on characteristics of the pipe, its use in diversified industries, chemical resistance, properties, etc. For your copy, use Reader Service Card.

L—570. Plating Range Cells—Construction features and advantages together with illustrations of the many plating-range cells available from the Singleton Company, 10516 Western Avenue, Cleveland, Ohio, are contained in its Bulletin CS-2. For your copy, use Reader Service Card.

L—571. Plating Chemicals—A 52-page catalog on "Niacet Synthetic Organic Chemicals" presents in detail the physical and chemical properties, latest specifications, applications, and shipping and handling information on Niacet's line of chemicals. Data are included on acetic acid, sodium and potassium acetates used in plating baths, and zinc and copper acetates used to prevent silver from tarnishing, as well as 13 other organic chemicals. For your copy, address Niacet Chemicals Div., 1021 Niagara Building, Niagara Falls, N. Y., and mention PLATING.

L—572. Multi-Purpose Cleaning Compound—A multi-purpose cleaning chemical, identified as Detrex 10, is described in a new folder being distributed by the Detrex Corporation, Box 501, Detroit 32, Mich. This compound may be used as a medium-duty soak-tank cleaner, as an electrolytic cleaner for ferrous-metal parts, and as a water conditioner for all types of water-wash paint-spray booths. For your copy, use Reader Service Card.

L—573. Choice of Abrasive Belts—No. 4, Vol. 9 of the B-M Bulletin issued by Behr-Manning, Troy, N. Y., is devoted to the subject, "How to Choose the Behr-Manning Belt for Your Job". For your copy, use Reader Service Card.

L—574. Tumbling Process—A new Bulletin No. LS-50 on the Tumb-L-Matic dry process, released by Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y., describes the latest methods for cutting-down, deburring, definning, dry-burnishing and polishing of metal and plastic parts and the complete line of Type LS (single-tumbler) equipment. Tumb-L-Matic's specific process includes the correct type of barrel and barrel speed, and the right compound or medium. The compound can range in grades of abrasives and may be used with various ratios of chips or pegs, depending upon product to be finished. For your copy, use Reader Service Card.

L—575. Abrasive Grain—Aluminum oxide grain for polishing operations, designated as "Borolon", is described in Bulletin No. ESA-198 issued by Simonds Abrasive Company, Tacony and Fraley Sts., Philadelphia 37, Pa. Size recommendations and details on polishing-wheel set-ups are included. For your copy, use Reader Service Card.

L—576. Electrolytic Cleaning—The Industrial Division of The DuBois Company, Cincinnati 3, Ohio, has published a revised and enlarged edition of its popular electrolytic-cleaning booklet, "An Introduction to Electrolytic Cleaning". It contains information on the fundamentals of electrolytic cleaning, the phenomena that occur, the differences between the various processes, the attributes of a good electrocleaner, considerations in the choice of an electrocleaner for any particular process, etc.

New in this edition are the cleaning of diecast metals, the cleaning of cuprous metals including reverse-current cleaning without discoloration, soak-tank, cleaning, and paint stripping. Typical cleaning cycles and several case histories of actual plant operations with Alkon electrocleaner are given. For your copy, use Reader Service Card.

Precision Work requires a Precision Cleaning Compound

—so PERMAG takes over!

An exacting cleaning operation is going on here. The operator is handling this tube with greatest care to secure a *perfectly* clean surface inside and out. To achieve the best results PERMAG Compounds were selected and used in a specially prepared solution. The job was pre-eminently satisfactory.

Important as were all the items used for this work, it would have been a failure without the proper cleaning compound. PERMAG was a contributing factor for success.

MAGNUSON PRODUCTS CORP.

Mfr. Specialized Cleaning Compounds for Industry

50 COURT ST. BROOKLYN 2, N. Y.

In Canada: Canadian PERMAG Products Ltd. Montreal, P.Q.

Equipment and Supplies

E—635. Liquid Blast Cleaning Unit—A midget unit is offered by Pangborn Corporation, Hagerstown, Md., for liquid blast cleaning. It weighs only 40 pounds where aluminum can be used for the main housing, is operable from either a ¼-inch compressed-air line or any bottle of compressed gas, and has a blast chamber 15 inches in diameter.

Its principal fields of usefulness are said to include (1) die and mold polishing after heat treatment, (2) precision part polishing, (3) surface treatment better to hold light lubricating oil films, (4) cleaning of parts which function at high temperatures (e. g., spark plugs), (5) stain and light scale removal.

This No. O Type EZ Hydro-Finish Blast Cabinet uses the same wide range of abrasives (as fine as 5000 mesh) as its larger brothers, and can hold tolerances on blasted parts to within 0.0001 of an inch. It requires 110 volt ac to drive its filter and dust-bag motor and consumes 5–20 cfm of air at 80 psi (depending upon nozzle size). The abrasive-liquid mixture is slurried (and constantly bubbled) in a clear glass bowl of ½-gallon capacity at the base of the unit. Two sizes of suction-type blast nozzles may be had. For further information, use Reader Service Card.

E—636. Cadmium and Zinc Brighteners—Exceptionally brilliant deposits are easily obtained with Rohco Cadmium and Zinc Brighteners according to the manufacturer, R. O. Hull & Company, Inc., Dept. BF, 1300 Parsons Court, Rocky River 16, Ohio, and conversion of normal cadmium and zinc baths does not entail extra treatment or delay in production.

Rohco 20XL Cadmium Brightener, available as a liquid or powder, gives deposits said to be without parallel in uniformity of thickness and coverage in recesses. Because barrel solutions may be operated at unusually high temperatures (up to 105° F), maximum production is maintained. Wide latitude of concentration range provides ease of control.

Rohco 100 Barrel and Rohco 303 Still Zinc Brighteners, available as liquids, also are said to impart high covering power so that recesses, usually unplated, are easily covered with a substantial thickness of deposit. Both are readily controlled by visual inspection of deposits. For further information, use Reader Service Card.

E—637. Bright Chromium on Zinc and Cadmium—Of major importance to the automotive and appliance fields may be the announcement by The Wire Coating and Manufacturing Company, 395 E. 131st St., Cleveland, Ohio, of the filing of patent applications covering the electrodeposition of a bright decorative chromium plate over zinc or cadmium plated zinc- or magnesium-base diecastings, aluminum, or steel parts. Sizable quantities of materials are available.

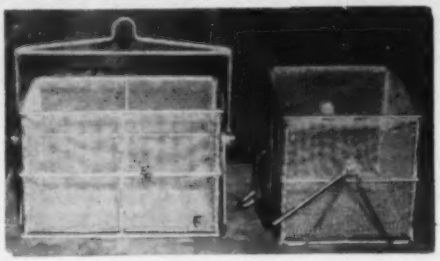
The company anticipates that use of this process will permit a great saving in nickel and copper metals. It further anticipates that this development will find widespread application in the expanding war effort where protective finishes are required. For further information, use Reader Service Card.

E—638. Aluminum Bright Dip—Kaiser Aluminum & Chemical Sales, Inc., Palmolive Building, Chicago, Ill., announces the development of a new and inexpensive process for brightening aluminum and its alloys said to be easily controlled and free of occupational hazards. Using a low acid concentration the bath is said to be easily maintained by inexpensive periodic additions of the active components to give it unusually long life.

The process, on which patents are pending, will be made available under license to aluminum fabricators and pro-

Operation
SMOOTH
"BREAK ALL CORNERS" is again required on machined parts for defense orders.
SIEFEN'S BRUSHING NUGLU will produce these specifications easily and quickly; PLUS simple cleaning of parts by water.
J. J. Siefen CO.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 193.



Baskets for Batch Work

YOU can save time and avoid tie-ups by having your baskets for pickling, washing and rinsing made to order for the job. Storts makes them of plain or galvanized steel, stainless steel or other alloys—and Storts can help you in designing them to assure proper strength and stiffness for long life.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 194.

Mutual

CHROMIC ACID

OTHER NAMES: Chromic Anhydride, Chromium Trioxide
FORMULA: CrO_3
MOLECULAR WEIGHT: 100.01
DESCRIPTION: Deliquescent, dark red flakes. Bulk density averages 105 lb. per cu. ft.

CrO_3	99.75% min.
Chloride as Cl	0.01% max.
Sulfate as SO_4	0.1% max.
Insoluble in water	0.01% max.

USES: Chromium plating. Anodizing of aluminum. Metal surface treatment, including cleaning, pickling, etching, coloring and improvement of corrosion resistance and paint adherence. Pigment manufacturing. Organic oxidation syntheses, as in the production of dyestuffs and pharmaceuticals. Manufacturing other chromium chemicals and catalysts.
SHIPPING CONTAINERS: Steel Drums—100 lb. net.

OTHER MUTUAL PRODUCTS

Sodium Bichromate — Sodium Chromate
Potassium Bichromate — Potassium Chromate
Ammonium Bichromate

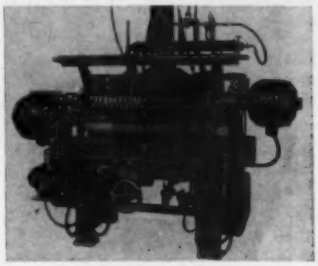
MUTUAL CHEMICAL COMPANY OF AMERICA

270 Madison Avenue — New York 16, N. Y.

MUTUAL SINCE 1845

cessors. For further information, use Reader Service Card.

E—639. Small Parts Finishing Machine—A surface-finishing machine capable of simultaneous finishing of both insides and outsides of spoon and fork bowls and similarly shaped small parts has been introduced by Clair Manufacturing Company, 1016 S. Union St., Olean, N. Y.



In operation, the rack of the Clair No. 204 machine moves in order to expose simultaneously the inside of the bowl-like shape to small-diameter preformed convex buffs and the outside diameter to large-diameter concave buffs. Adjustments which compensate for variations in bowl depth and length are included.

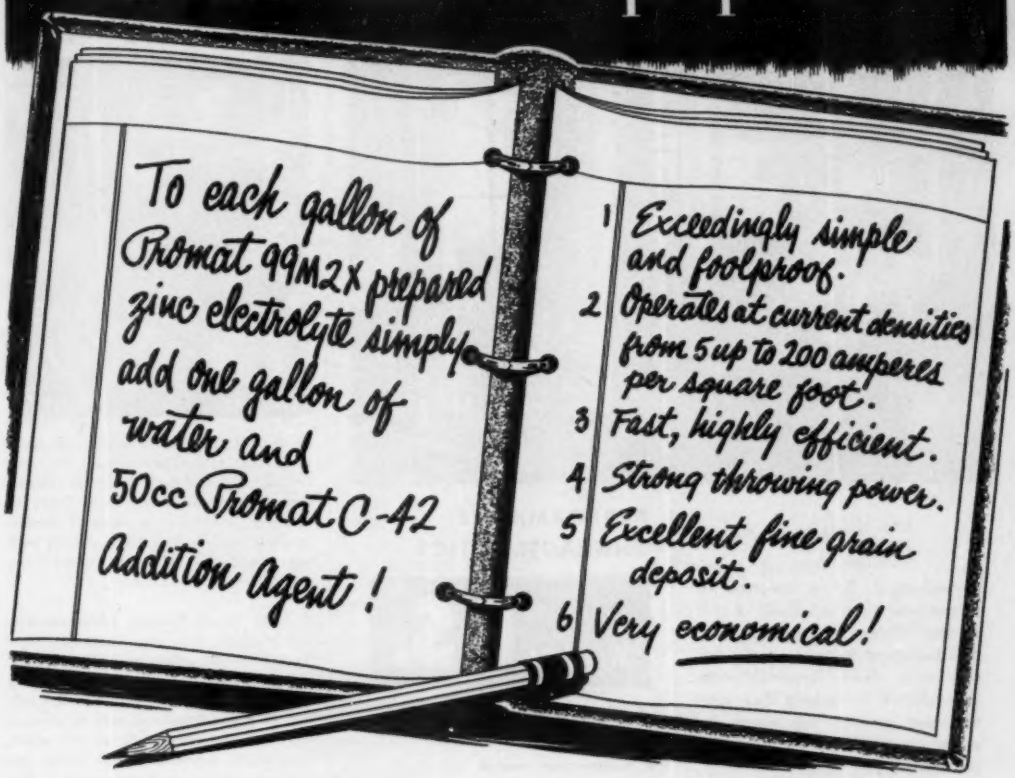
This two-spindle machine has an electro-hydraulic actuation system, with totally enclosed hydraulic circuits. Rolls are opened and closed by a compressed-air circuit which also permits automatic float of the counterbalanced rolls in following irregular contours. Adjustments for speed and magnitude may be made without stopping the machine, and over 20 optional features and modifications are available. For further information, use Reader Service Card.

E—640. Water Dip Lacquered Copper for Electronic Parts—Maas & Waldstein Company, 438 Riverside Ave., Newark 4, N. J.; 1650 Carroll Ave., Chicago 12, Ill.; or 10751 Venice Blvd., Los Angeles 34, Calif., reports the use of its Water Dip No. 33 Lacquer for prevention of finger printing, water staining and oxidation on copper plated radio-chassis and similar parts. Such parts can be soldered or spotwelded. No drying is needed because the parts can be lacquered directly as they come from the hot rinse after plating. For further information, use Reader Service Card.

E—641. Black Oxide Finish—Empire Solvents, Inc., 153 E. 26th St., New York 10, N. Y., offers an improved process for producing black oxide finish on steel and iron. One bath is used within the wide operating range of 280–300° F. Less than usual concentration of salts are said to be used in the bath, and maintenance additions are correspondingly smaller. For further information, use Reader Service Card.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 195.

FORMULA for simplifying alkaline zinc bath preparation


To each gallon of Promat 99M2X prepared zinc electrolyte simply add one gallon of water and 50cc Promat C-42 Addition Agent!
1 Exceedingly simple and foolproof.
2 Operates at current densities from 5 up to 200 amperes per square foot.
3 Fast, highly efficient.
4 Strong throwing power.
5 Excellent fine grain deposit.
6 Very economical!

● Promat 99M2X Zinc is a completely mixed, filtered and purified electrolyte containing all of the standard electrolyte ingredients plus a quantity of Promat C-42 Addition Agent and Promat Doctor Solution Purifier. Easy to prepare and maintain, it is the ideal answer for plants now doing zinc plating, plants entering the plating field and those converting from other metals to zinc. The two times concentrated electrolyte is shipped in 30 gallon returnable drums.

It will pay you to investigate this simple, low cost way to better zinc plating. Write for details today.

It's Promat for Preparation, Plating and Protective Chemicals

DISTRIBUTORS

HAVILAND PRODUCTS CO.
Grand Rapids, Michigan

WAGNER BROTHERS, INC.
Detroit, Michigan

PROMAT DIVISION
Poor & Company
851 S. Market Street, Waukegan, Ill.

DISTRIBUTORS

BART-MESSING CORP.
Belleville, New Jersey

REYNOLDS-ROBSON SUPPLY CO.
Philadelphia, Pa.

ARDCO, INC., Chicago, Illinois

For low-cost electrocleaning use Wyandotte F. S.

Wyandotte F. S.* is designed for heavy-duty electrocleaning. It is a reverse current electrocleaner of well-balanced formula, gets work chemically clean. Important, too, Wyandotte F. S. has long life in solution and contains ingredients for water conditioning and improved rinsing.

While F. S. is used primarily for the cleaning of ferrous parts, it is satisfactory for heavy-duty electrocleaning of copper, bronze and magnesium. We suggest you write us, at Wyandotte, for the Technical Information sheet on F. S.

*Reg. U.S. Pat. Off.

Owning its basic raw materials places Wyandotte in an especially advantageous position o maintain quality—supply large quantity needs consistently.

PERFORMANCE CHARACTERISTICS

Wyandotte F. S.

- Exceptional detergency for removal of fabricating oils and smut
- Excellent smut removal
- High conductivity for maximum gas scrubbing action
- Fast and complete wetting action
- Controlled foaming
- Proper conditioning of hard water
- Very free rinsing
- High soil suspension ability
- 100% solubility in water
- Outstanding solution life
- Controlled uniform quality

THE WYANDOTTE LINE— products for burnishing and burring, vat, electro, steam gun, washing machine and emulsion cleaning, paint stripping, acid pickling, related surface treatments and spray booth compounds. An all-purpose floor absorbent: Zorball. In fact, specialized products for every cleaning need.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN
Service Representatives in 88 Cities

Wyandotte
REG. U. S. PAT. OFF.

Equipment and Supplies

E—642. Rubber Pails—Hanson-Van Winkle-Munning Company, Matawan, N. J., offers a slightly flexible molded-rubber pail with a reinforced base having a unique safety-grip to give a firm hold for pouring. Graduated markings on the

inside of the pail permit accurate measurements from 1 quart to 3 gallons. The lead-coated stainless-steel bail-type handle with hard-rubber grip moves freely in cast-lead bearings. This allows the handle to move easily but prevents it from pulling out of place. For further information, use Reader Service Card.

E—643. Silver Plating Addition—Enley Products, Inc., 254 Pearl St., New York 7, N. Y., offers an addition agent, "Silver Speed", for cyanide-silver plating solutions. One gallon added to 200 gallons of present baths is said to produce adherent, high-speed, soft, smooth, white, semi-bright deposits. Such baths are easily maintained and economical to use. Used in any set-up, in heavy production or with PR units, they require no bath agitation. For further information, use Reader Service Card.

E—644. Bright Chromate Finishes for Zinc—Allied Research Products, Inc., 4004-4006 E. Monument St., Baltimore 5, Md., has announced the addition of two new chromate finishes to its line of Iridites for dip bright finishing of zinc-plated surfaces. Iridite No. 8P is sold in powder form instead of liquid form, which provides the advantages of lower freight rates, easier handling, and elimination of the use of carboys and their returns. Cost per gallon of working solution depends on whether one operates in the yellow color ranges or the blue-bright range.

Iridite No. 12 for bright zinc plate both passivates and imparts a chromium-like appearance. It is shipped as a concentrate which is diluted with 50 parts of water to make a working solution. Un-

BARREL NICKEL PLATING TO SPECIFICATION

using

SEYMOUR BRIGHT NICKEL PROCESSES

Where specific thicknesses of bright nickel are desired, use Seymour "NC" or "CK" Bright Nickel Processes in a warm plating bath. The warm type brightener solution permits specification barrel nickel plating of any desired deposit from .0002" to .0010", and at a speed four to six times faster than with a cold solution.

Seymour solutions are also available for cold plating baths where a deposit of about .0001" maximum is desired. Both warm and cold type brighteners are simple to maintain and easy to control. Deposits are adherent to properly cleaned base metals, except zinc base direct, and may be chromium plated without prior buffing or wiping.

WRITE FOR COMPLETE INFORMATION

Nonferrous Alloys since 1878

THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONN.

SEYMOUR

NO LIMIT ON ZINC TO REPLACE CADMIUM IN ELECTROPLATING

Zinc-Luster-on (R) Treatment Offers Superior Finish — Permitted by NPA Order

Latest NPA Order on Use of Zinc (M-15 as amended Jan. 15, 1951) leaves way open for present cadmium platers to stay in business and at same time offer superior finish on products. Paragraph 28.27 specifically exempts from 80% quota or 3,000 lb. monthly clause use of zinc "in electroplating where it replaces cadmium".

Passivated zinc has long been recognized by eminent authorities to be equal or actually superior to cadmium for most applications except in direct marine atmosphere. This recent NPA order may result in its becoming life-saver to cadmium-starved industries. Within quota restrictions same applies to nickel casualties.

Luster-on is original passivating bright dip introduced in 1944 by Chemical Corporation of Springfield, Mass. In recent months their newest formulations tagged "Luster-on Utility-15" and "Luster-on Utility-25" have amazed finish experts with their brilliance, ease of application and control and low cost. Cost figures under 1/5¢ per square foot have been verified again and again by large users.

Stromberg-Carlson, Magnavox, Monowatt Div. of G. E., National Lock, American Cabinet Hardware, Simmons Co., Bonney Forge & Tool, Canadian Marconi, Canadian G. E., American Bosch, Westinghouse, Ternstedt Div. of General Motors, Peerless Wire and hundreds of similar national accounts are using Luster-on Utility Dip on their plated zinc.

Shortage of certain raw material ingredients will limit quantity of Luster-on available for 1951. Former users of nickel and cadmium are converting almost daily. Chemical Corporation is, however, still accepting applications of well-rated concerns for 1951 allotments. Preference naturally goes to products where demonstrated superiority and economy of zinc-Luster-on finish can bring change in specifications after return of cadmium or nickel.

Suggest writing Metal Finishing Department, Chemical Corporation, 57 Waltham Ave., Springfield, Mass., for technical data and to discuss your requirements. Company will process sample parts without charge and furnish engineering service on conversions to Luster-on.

LUSTER-ON (R) LIGHT KHAKI ANNOUNCED; FOR U. S. ORDERS ONLY

As this column went to press a new Light Khaki color Luster-on Dip for zinc-plated surfaces was announced by Chemical Corporation, 57 Waltham Ave., Springfield, Mass. The new material is shipped in highly concentrated form which makes it the most economical such treatment on the market. At present it is available only for U. S. Government orders. Sample parts will be treated free.

Advertisement

Equipment and Supplies

like other Iridites it provides relatively little chemical-polishing action and should be applied only to bright zinc. However, operating costs are said to be extremely low. For further information, use Reader Service Card.

E—645. pH Papers—The Udylite Corporation, Detroit 11, Mich., offers *p*H papers in four ranges: No. 701—*p*H 11.0–13.1; No. 4862—*p*H 4.8–6.2; No. 3650—*p*H 3.6–5.0; No. 2439—*p*H 2.4–3.9, all said to be very accurate in comparison with electrometric values. For further information, use Reader Service Card.

E—646. Cadmium and Zinc—Allied Research Products, Inc., 4004–4006 E. Monument St., Baltimore 5, Md., now offers three organic materials, all of which are said to be adaptable to any type of equipment and to provide high throwing power and bath efficiency, uniform coverage, and high-quality work.

For zinc plating, ARP No. 5 is particularly good in low-current-density ranges and is capable of producing a bright plate with a bluish chromium-like cast directly from the plating solution, and ARP No. 3 operates particularly well at higher current densities and produces a zinc plate with a bright yellowish nickel-like cast. For cadmium plating, ARP No. 4 operates at any current density and produces a silvery bright plate. For further information, use Reader Service Card.

E—647. Adherent Organic Finish—"Rexadhere", a new product of Rexton Finishes, Inc., 62 Woolsey St., Irvington 11, N. J., is said to exhibit excellent adhesion to cadmium, plastic board, Bakelite, zinc, magnesium, chromium, etc., as well as to brass, aluminum, steel, etc.

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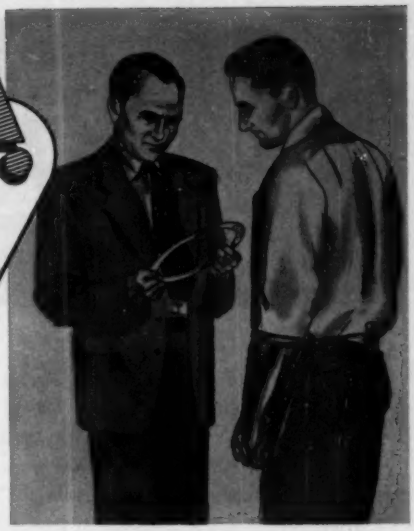

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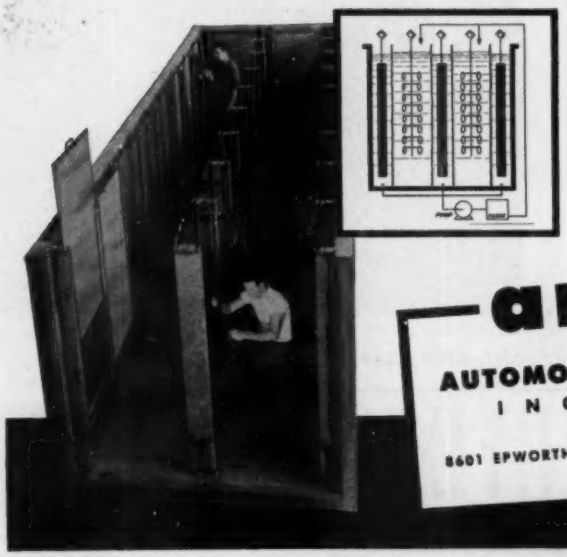

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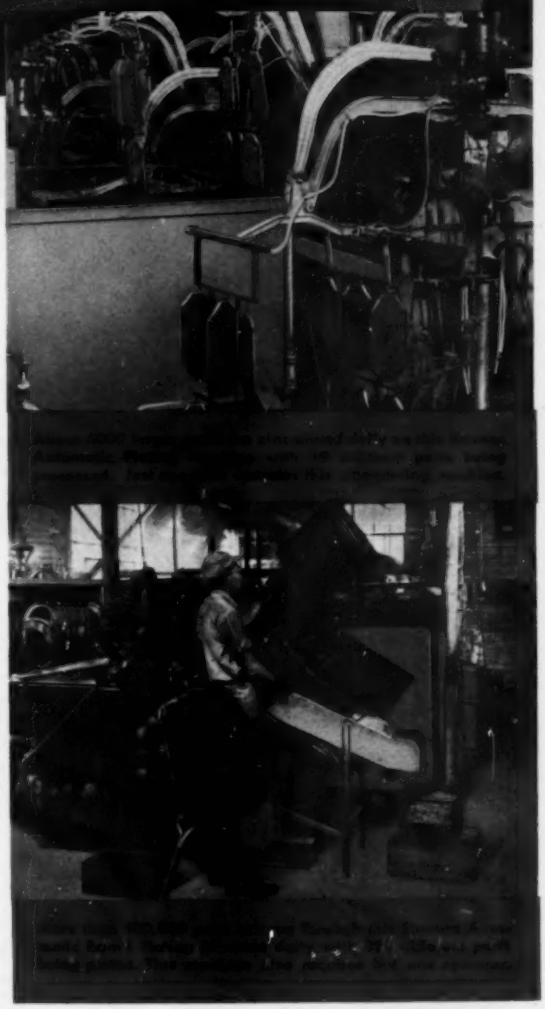

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Contents

Cyanide Waste Disposal and Control 240
C. F. Hauri

The Electroplating Industry in Atlanta: I 243
Victor J. Baran

Rotogravure Roll Making 248

Government Specifications 253

Buffalo—1951 A. E. S. Convention City 254

Methods for Testing Thickness of Electrodeposits. II. Comparison of Methods for Nickel on Steel 255
Harold J. Read and F. Ross Lorenz

Cleaning and Preparation of Metals for Electroplating. I. Critical Review of the Literature. Errata 254
H. B. Linford and E. B. Saubestre

Washington Orders 264

Sustaining Membership List 298

Monthly Features

Industry News 210

Personals 218

Trade Literature 224

Equipment and Supplies 229

Editorial 239

Book Review 265

Question Box 266

Article Abstracts 269

Patent Abstracts 272

A. E. S. News 280

Branch News 282

Membership Report 296

A. E. S. Directory 300

Advertising Index 303

Future Meetings 304

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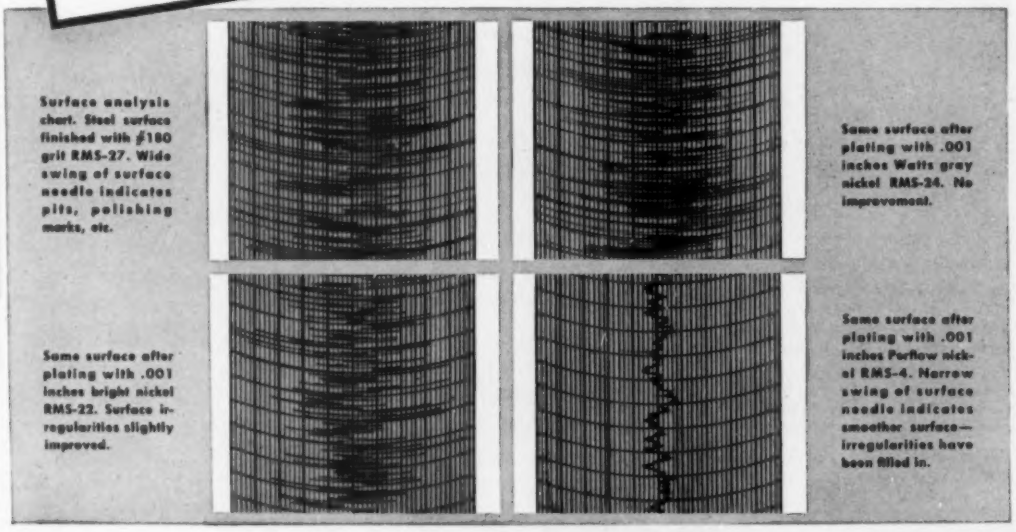

Surface analysis chart. Steel surface finished with #180 grit RMS-27. Wide swing of surface needle indicates pits, polishing marks, etc.

Same surface after plating with .001 inches Watts gray nickel RMS-24. No improvement.

Same surface after plating with .001 inches bright nickel RMS-22. Surface irregularities slightly improved.

Same surface after plating with .001 inches Perflow nickel RMS-4. Narrow swing of surface needle indicates smoother surface—irregularities have been filled in.

THE HARSHAW CHEMICAL CO.
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Editorial

Supplementary Organic Finishes

IN THESE DAYS OF SHORTAGES it is essential that all possible substitutes and partial substitutes for metallic coatings be given careful consideration.

Fortunately, one partial substitute, the organic finish, has behind it a great deal of experience in certain industries. For example, a wide variety of decorative articles, such as silver or gold plated holloware, novelties, jewelry, buttons and insignia, has long been lacquered on top of the plated coating. The same is true of brass or copper plated building hardware, lamps, and art goods, as well as of zinc plated refrigerator racks.

Years ago this writer observed that lacquer coatings very substantially improve the protection afforded steel by thin cadmium coatings. Three sets of panels were exposed on a roof in Detroit. One set with only a nitrocellulose lacquer coating began rusting after two weeks, another with only 0.0002-inch cadmium started to go after about five months. But a set with the same lacquer coating on top of 0.0002-inch cadmium was in good condition, except in lacquer cracks, after a year and had large unattacked areas after three years. With presently available chromate treatments and greatly improved lacquers one would expect even better results today. In most cases zinc would have to be used instead of cadmium.

A great deal of interest is currently being manifested in similar combinations, and we hear of several actual applications. Among promising combination coatings are buffed 0.0001–0.0002-inch chromium (a thickness commonly used on golf clubs) and lacquer; brightened 0.0003-inch thick zinc and lacquer; and, for electronic parts requiring soldering or spot welding, copper with a water-dip lacquer. As a matter of fact, we have seen zinc plate which after certain proprietary brightening treatments and lacquering could hardly be distinguished from bright chromium.

With increased demand, shortages are likely to develop in some lacquer components. To protect himself the lacquer user should therefore try lacquers of different formulations and make certain that he has something satisfactory upon which he can fall back in case of need.

Gustaf Soderberg

CYANIDE WASTE DISPOSAL AND CONTROL

C. F. HAURI

Plating Engineer, Delco-Remy Division, General Motors Corporation, Anderson, Ind.

IN THE PAST few years the status of waste control has evolved from that of a nuisance to a major problem at the Delco-Remy Division of General Motors located at Anderson, Ind.

This discussion will be confined to wastes contaminated with cyanide from plants built and operating before any consideration was given to waste disposal. Under such conditions the problem is different from that encountered if a plant were being built today, when waste control would receive the same consideration as other major engineering and manufacturing problems.

Waste-control and water-conservation programs usually go hand in hand, and the importance of both is being realized in all phases of the economy. Good water is necessary for promoting and sustaining life, its absence causing death and destruction, because there is no substitute for good water. Industrial use of water can be condoned only if compatible with the prior or subsequent demands by any form of life. The ultimate aims of these programs are conservation of the supply and discharge of the used water in as near the original condition as possible.

The main problem at Delco-Remy is the disposal of cyanide wastes. About five years ago we received a jolt when reconversion from war production dictated that a group of plants was to have a considerable increase in cyanide plating and heat treating. It was necessary to start these processes before the city had adequate sewage facilities, and we were forced to discharge our process waters to a small stream that emptied into White River immediately above the reservoir where the local water supply was obtained.

As a consequence, a program was instituted in our plants that practically meant "Nothing in the sewer". We were obligated to hold the cyanide content of our process waters to not more than 2 ppm (2 mg/l). This was to be done without the benefit of the dilution furnished by the sanitary sewage. At this time we could only think that a disposal plant would be required; its construction, however, would take time and money, and it was imperative to do something immediately. Therefore, an emergency program was initiated that has functioned so satisfactorily that our thinking regarding a disposal plant to treat our process waters has been modified. Even though our process waters do now go to the city disposal plant, we will continue the same treatments and controls developed during the emergency period.

One of the major problems was to prevent as much as possible of 35,000 gallons (130,000 liters) of cyanide plating solution from entering the sewer. The average concentration of these solutions will exceed one pound per gallon of sodium cyanide. To maintain these baths, 20,000 pounds (9,000 kg) of sodium cyanide are used monthly; in addition, various heat-treating installations require an additional 10,000 pounds (4,500 kg) of cyanide-bearing salts. Water consumption is approximately 100 million gallons (380 million liters) a month.

To meet these conditions, the following procedures were inaugurated as emergency measures:

1. Reclaim stations were added to all cyanide and chromium plating installations.
2. A collection system was established for all waste paint, grease, oil, solvent, etc. Those that had previously been discharged to the sewer are now disposed of by burning or otherwise.
3. The disposal of non-cyanide alkaline wastes was done in conjunction with spent pickling liquors; thus, the *p*H of the sewage was not unduly influenced.
4. All usage of cyanide in cleaning solutions, dips, etc., was discontinued.
5. Destruction of all solid or concentrated plating wastes and cyanide-bearing heat-treating salts was begun.

Mechanical Reclaim of Plating Solutions

To lessen a disposal problem it is necessary to eliminate at the source as much of the contamination as possible. Here the greatest economic returns can be had, and it is safe to say, "The more kept from the effluent, the less to destroy". Perhaps no single item will do as much to keep the cyanide content of rinse waters at a minimum as a good mechanical reclaim program. Obviously, where evaporation losses are high, this is easily done. When a solution is operated at room temperature, however, evaporation losses are likely to be small. Hence, conditions are the least favorable for utilizing a reclaim in conjunction with cadmium and zinc plating baths which operate at 90°

F (32° C). Additional difficulty is encountered with a reclaim in automatic equipment because drag-in will approximately equal drag-out.

The principal equipment used for zinc plating is the Stevens automatic barrel-plating machine. This consists of a series of processing tanks above which is mounted a conveyor mechanism which automatically moves the work containers step by step through the cleaning, plating, rinsing, and drying operations. These machines have the capacity to plate 1,500 square feet (140 m²) of surface area per hour; a single basket load containing 20–25 square feet (1.9–2.3 m²) of work area will be removed from the plating every minute.

To meet the zinc plating requirements at our plants, six such machines are in operation in addition to eleven 14 x 30-inch (36 x 76-cm) horizontal barrels. The zinc solutions in this equipment contain in excess of one pound per gallon (120 g/l) of sodium cyanide and deposit approximately 30,000 pounds (14,000 kg) of zinc each month.

Two stations are used in adapting the reclaim program to a plating cycle. In the first reclaim station after plating, the work is tumbled to dislodge as much concentrated solution as possible into a tank, the solution level of which is kept below the work level. This we call a drip reclaim. The tank at the next station is filled with water, and we refer to this as a dip reclaim.

In attempting to use reclaim stations in this manner, it was found that only a small portion of the reclaimed solution could be added back to the plating bath due to the previously mentioned drag-in. Consequently, the reclaimed solution soon approached the concentration of the plating bath in concentration and was then ineffective in decreasing the amount of cyanide carried into the subsequent flowing rinses. To improve this situation it was necessary to find a way to use more of the reclaimed solution. This could only be done by eliminating the drag-in, operation of the plating baths at higher temperatures being detrimental.

The drag-in was kept to a minimum by tumbling the work in an empty tank preceding plating. By such reduction of drag-in of solution or water, the level of the plating bath kept dropping so that the reclaimed solutions could be added back to the plating bath more frequently. By adding the dip-reclaim solution to the plating bath as frequently as possible one will reduce the cyanide content of the rinse waters to a minimum.

In rack plating the same procedures are used. An air blowoff is utilized to dislodge as much solution as possible into the first reclaim. This consists of a sirroco fan and a system of ducts so arranged as to be effective over the entire rack. All plating performed by this type machine was restudied as to racking methods so as to reduce drag-out as far as possible.

Destruction of Solid and Concentrated Wastes

The previous section was concerned with decreasing the cyanide content of rinse waters. We will now discuss the methods used to dispose of other cyanide wastes.

All cyanide wastes to be transported within the plants must be in special containers designed for this use. These containers are 55-gallon (208-l) steel drums with a removable top painted yellow and with an 8-inch (20-cm) black band around the drum at the center. On this black background is stenciled the word "Cyanide" in 4-inch (10-cm) white letters. These barrels are requested from the cyanide disposal department by the foreman of the department having need of them. When filled, they are returned accompanied by a red tag furnished by the Safety Department, which must be executed by the foreman stating the contents and origin. These special barrels were deemed necessary to preclude the sale of a barrel previously containing cyanide to an individual by the Salvage Department and also to prevent accidental transportation to a dumping ground.

The material received at the disposal station originates from the following sources: sludge from plating baths, discarded heat-treating salts, floor sweepings from heat-treating operations, residue from cyanide-ventilating systems. These will aggregate about 8,000 pounds (3,600 kg) per month, of which cyanide wastes from heat treatment average 5,000 pounds (2,300 kg) per month, and those from plating operations 3,000 pounds (1,300 kg) per month. Not included in the total are such incidentals as furnace bricks, sections of pipe, gravel from roof tops, etc. The pipe comes from heat exchangers used in cyanide plating, the gravel, from the vicinity of ventilating stacks of cyanide operations. Solid salts are dissolved from defective heat-treating-cyanide pots before salvaging.

The disposal stations consist of a series of tanks which had previously been used for paint stripping and had been modified for the present purpose. They include three tanks which are used for dissolving the material received for disposal. Two of these tanks are each of 200-gallon (760-l) capacity; the other is of 500-gallon (1,900-l) capacity, and all are serviced with water, heating, and ventilation. Another tank 500-gallon (1,900-l) is used exclusively for treating the dissolved material. It is equipped with ventilation and a drain 6 inches (15 cm) from the bottom.

Material to be treated is placed in perforated containers, which are then immersed in hot water in the dissolving tanks by means of a hoist. The insoluble residue is frequently removed from the dissolving tanks, and as a precautionary measure each 3- or 4-inch (8- or 10-cm) layer of this material in a standard steel barrel is interspersed with a liberal sprinkle of chlorinated lime before it is carted to a dump. To the combined solutions in the treatment tank is then added chlorinated lime in small amounts accompanied by vigorous mechanical stirring. The operator has facilities to make a qualitative check for chlorine, and when such indication is obtained, a sample is taken to the laboratory for cyanide determinations.

This check for chlorine may be of interest because

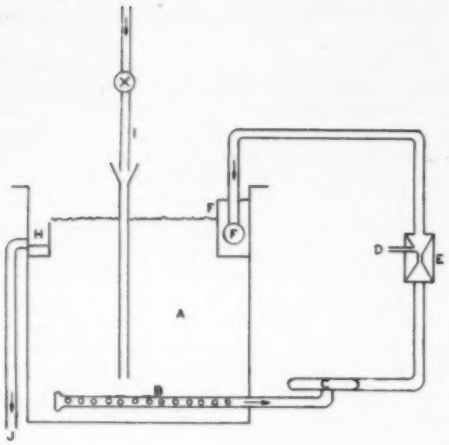


Fig. 1. Rinse tank arranged for continuous destruction of cyanide in rinse water. A, rinse tank; B, inlet to chlorinator; C, pump; D, chlorine inlet; E, chlorine injector; F, sump with pH cell; G, diffuser pipe; H, overflow trough; I, fresh-water inlet; J, effluent

it is the reverse of the ordinary colorimetric determination of small amounts of chlorine. To a test tube containing 50 ml of water that had previously been chlorinated to not more than 1 ppm (1 mg/l) is added a drop or two of ortho-tolidine. A pale yellow color will develop. On the addition of a few drops of solution from the treatment tank the yellow color will disappear if cyanide is present and will become deeper if free chlorine is present.

From the time the sample which tested free chlorine is taken for a laboratory determination, the treated solution is allowed to settle for one hour. This is sufficient time for the determination of cyanide to be completed and allows the lime to settle to the bottom of the tank. The clear liquid is discarded to the sewer, and the precipitated lime is periodically removed to a lime pit on our property.

Chemical Treatment of Rinse Water

With the aforesaid program in operation, thought was turned to ways and means of further reducing the cyanide content of the sewer effluent caused by rinsing operations. The work so far had dealt with mechanical methods of preventing contamination, and these seemed to have been carried as far as possible. Therefore, there seemed to remain only chemical destruction of those quantities of cyanide unavoidably dragged into and contaminating the rinse waters.

The traditional method of accomplishing this result is to construct a basin or holding tank where all such waters can be treated to eliminate the undesirable constituents. We have previously mentioned that this is impractical in our case.

The only other possible approach was to destroy the cyanide in the rinse water before it entered the sewer, in other words, as part of the rinsing cycle after plating. The best method for destruction of cyanide was considered to be alkali chlorination. Accordingly, chlorinated lime was added to a rinse after plating in a preliminary experiment to observe the effect on plated work, equipment, etc. No adverse effect was noted. It was therefore decided to try the destruction of the cyanide carried from an automatic-barrel zinc plating tank through the two reclaim stations. Because this is an automatic operation, it was necessary to feed chlorine continuously, and in this case the only practical procedure was to use liquid chlorine.

At first thought it may seem that very little apparatus or equipment would be necessary for chlorination of waste waters. An investigation showed that because of the limited solubility of chlorine in water, it is necessary to disperse chlorine gas thoroughly into the liquid to be chlorinated by means of suitable apparatus and methods. Two other factors had to be taken into consideration. An excess of chlorine would be liberated into the atmosphere if chlorine were simply bubbled through water. This must be avoided both for economic reasons and because any escape of chlorine into the plant would be intolerable.

The purveyors of chlorinating equipment helped us in the selection of the following equipment:

One 100-lb/day commercial chlorinating machine
One 600-gal/hr circulating pump
One indicating *p*H meter
The plating solution contained:
5–5½ oz/gal (38–41 g/l) zinc
13–16 oz/gal (98–120 g/l) total sodium cyanide
12–14 oz/gal (90–105 g/l) total caustic soda

With approximately 1,500 sq ft of surface area per hour being plated in the machine, the rinse following the two reclaim stations contained:

200–400 ppm sodium cyanide at a water flow of 15 gpm (57 l/min)

The rinse tank was altered as follows so that it would be suitable for the chlorine treatment:

1. Ventilation was added.
2. A screened bottom outlet was provided and connected to the chlorinator inlet.
3. A sump was constructed in a portion of the rinse tank by means of welding. In operation, the return from the chlorinator flows into the sump and overflows into the main body of the rinse tank. The purpose of the sump is to cause diffusion and to house the electrodes of the *p*H meter. (See Fig. 1.)
4. The pump was inserted into the inlet line to the chlorinator.

The rinse water is pumped from the tank and is chlorinated as it passes through the injector of the chlorinator machine. The flow is greatly restricted at the orifice of the injector, and the resultant vacuum draws the chlorine gas into the stream and also results

(Continued on page 265)

This Article

presents what we believe to be the first unbiased and detailed study of the plating industry in any city in the United States.

Incidentally, it illustrates the tremendous growth of industry in general, and with it the plating industry, which has occurred in the South since the last war.

In pointing to certain weaknesses in the organization and management of job-plating shops, it confirms findings in other parts of the country. Many job-shop owners are painfully aware of these conditions and are gradually overcoming them.

THE ELECTROPLATING INDUSTRY IN ATLANTA I

VICTOR J. BARAN

Bureau of Population and Economic Research, University of Virginia, Charlottesville, Va.

In 1949 a survey was made of the electroplating market in the Atlanta metropolitan area, part of which covered the general nature, character, and scope of the metal-finishing industry in the area. The study covered primarily electroplating and did not include finishing by enameling, galvanizing, or rubberizing. The war years, 1941–1944, were not included because it was felt that they would not give a representative picture of the industry. The complete report of the study is available at the library of the Georgia Institute of Technology*.

The survey included (1) plants which produce finishes for their own consumption; (2) job shops; and (3) industrial consumers who purchased their metal finishing from other shops, either in Atlanta or elsewhere.

Interviews were made with persons representing management in some capacity. They included owners of plants, company executives, cost accountants, or metal-finishing-department heads when no one else could give the data required. No effort was made to obtain data concerning finishing for other than industrial consumption. Since the survey was made in 1949, the data for 1949 and 1950 were estimated by management.

An attempt was made to determine the actual dollar volume of metal finishing produced in the area. This information was difficult to obtain for two primary reasons: inadequate cost records and reluctance to give information which the companies preferred to hold confidential. However, reasonable estimates of their volume could be made, because equivalent figures on materials consumed in the process were given more readily. These were substantiated by reports from the consumers about the amount of finishing which they bought from the job shops.

The data for the amount of metal finishing purchased by industrial consumers within the area were readily obtained from plant owners, company executives, and purchasing agents and are considered accurate.

Excellent cooperation was received from all individuals interviewed. In all, interviews were made with about twenty metal finishers and about three hundred consumers or potential consumers of finishing. These interviews included all the plants of importance, except the automobile assembly plants.

Number of Plants Engaged in Electroplating

Table I shows the number of job shops and plants which produce metal finishing for their own consumption in the metropolitan Atlanta area. The number of job shops increased from three to five during the period 1940–1949, and the plants producing metal finishings for their own consumption increased from eight to fifteen. This latter increase may indicate several things. First, there has been an increased demand for metal finishing which cannot be supplied by the job shops; or, second, the job shops do not have the facilities for producing the kind of work desired. Several plants which do their own work reported the second reason for developing their own metal-finishing departments.

The table shows further that for the period 1940-1949, the number of plants doing metal finishing in the area almost doubled.

*A survey of the Atlanta Market for Electro-Metal Finishing.

TABLE I. NUMBER AND TYPE OF PLANTS IN THE ATLANTA AREA PRODUCING METAL FINISHING

Purpose of Product	Year					
	1940	1945	1946	1947	1948	1949
For sale	3	3	4	5	5	5
For own use	8	8	11	12	15	15
Total	11	11	15	17	20	20

TABLE II. NUMBER OF PLANTS IN THE ATLANTA AREA PRODUCING METAL FINISHING, BY TYPE OF FINISHING DONE

Type of Finishing	Year					
	1940	1945	1946	1947	1948	1949
Anodizing	1	2	3	3	3	3
Cadmium	5	8	8	8	10	9
Brass	0	1	2	2	2	2
Chromium	5	4	5	6	11	11
Copper	8	6	9	11	15	15
Gold	0	1	3	3	3	3
Nickel	9	6	9	11	15	15
Silver	2	3	4	4	4	4
Tin	0	0	1	1	2	2
Zinc	5	5	4	4	4	4

TABLE III. NUMBER OF JOB SHOPS IN THE ATLANTA AREA, BY TYPE OF FINISHING DONE*

Type of Finishing	Year						
	1940	1945	1946	1947	1948	1949	1950†
Anodizing	0	0	1	1	1	1	1
Cadmium	3	3	3	3	3	3	2
Chromium	3	2	2	2	4	4	4
Copper	3	2	2	3	4	4	4
Nickel	3	2	2	3	4	4	4
Zinc	2	2	2	1	1	1	2

*No job shop reported doing industrial brass, gold, silver or tin plating.
†Estimates by management.

A year-by-year trend in the total number of plants producing different types of finishes is shown in Table II. For job shops only, this information is summarized in Table III. It will be seen that substantial increases occurred in the number of plants doing chromium and nickel plating.

As an indication of the size of these plants in 1949, thirteen plants employed less than ten workers. Three of these are job shops. The largest job shop employed about forty workers, and the largest of the plants producing for themselves employed about sixty workers in the metal-finishing department.

The total number of workers in the metal finishing departments will be discussed later in this article.

A study was also made of the number of technically trained personnel in the electroplating industry in the Atlanta area. A technically trained man was defined as a college-trained chemist or chemical engineer. Out

of the twenty plants studied in 1949, there were only four which reported having a technically trained man in the finishing department. Two job shops out of the five reported having one each, two plants out of the fifteen which produced finishes for their own use reported having a total of two technically trained workers. The effect of the inadequate use of technicians will be taken up in a later section of consumer appraisal of the industry.

Trends in Consumption

The expansion of the electroplating industry in the Atlanta area is indicated by the increases in the consumption of metals and chemicals in practically all types of finishing. Because aggregate figures or trends for the industry as a whole do not reveal the true nature or character of the expansion, the trends in volume of metals and chemicals consumed for each type of finishing is shown separately. As mentioned previously there are few plants which maintain complete and accurate cost data. Consequently, the following data are but approximate. Furthermore, it is difficult to interpret the data on the amount of metals used in terms of the amount of surface being plated, which is a better criterion of plant activity. However, some idea of the general trend of the industry may be obtained from the raw data, despite likely inconsistency in the correlation of the amount of metals consumed in copper, nickel, and chromium plating.

Nickel

The amount of nickel consumed in the Atlanta area (primarily for electroplating purposes) increased from 6000 pounds in 1940 to over 21,000 pounds in 1948. The consumption of this metal was about equally divided between job shops and plants doing plating for their own requirements. Estimates by management for 1949 and 1950 are 32,700 and 50,975 pounds, respectively. Fig. 1 shows the trend in consumption of nickel from 1940 to 1950.

Chromium

The consumption of chromium has also shown increases since the war, although not as large as those for nickel. The trend in chromium consumption, expressed in terms of chromic acid, is shown in Fig. 2.

Chromic acid consumption increased from about 5,000 pounds in 1940 to a peak of approximately 15,000 pounds in 1946. Since then it has decreased to an average of roughly 10,000 pounds per year. In comparing Fig. 1 with Fig. 2, it is noticed that there is a greater increase in the use of nickel, indicating that there was a greater expansion of nickel plating than of chromium plating.

Copper

In as much as copper is used to a large extent as a base plate preparatory to nickel and chromium, consumption of this element should follow the trend of increases in nickel and chromium finishing of ferrous

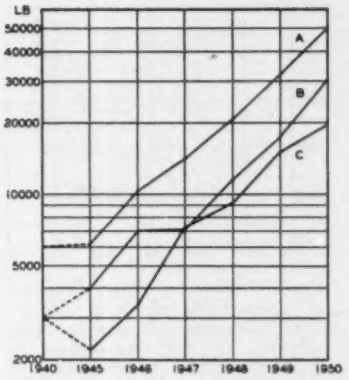


Fig. 1. Amount of nickel consumed by electroplating plants in Atlanta. 1949–1950 data estimated by management. A, total consumption; B, by job shops; C, by plants plating for own use

objects. That this trend does exist is shown by a comparison of Fig. 3 for copper consumption with Figs. 1 and 2 for nickel and chromium, respectively. The total consumption of copper in the Atlanta area rose from about 5,000 pounds in 1940 to over 14,000 pounds in 1948 with further increases expected by management to about 20,000 pounds in 1950.

Cadmium

The consumption of cadmium is shown in Fig. 4. There was an increase from about 5,000 pounds in 1940 to about 18,000 pounds in 1945, which was probably due to the wartime demand. A sharp decrease to 11,500 pounds occurred in 1946 and still less was used in 1947, which can be attributed to the tight market and unavailability of the metal. Estimates by management indicate a probable drop in 1949 and 1950, due to the greater availability and lower price of zinc and the higher cost of cadmium.

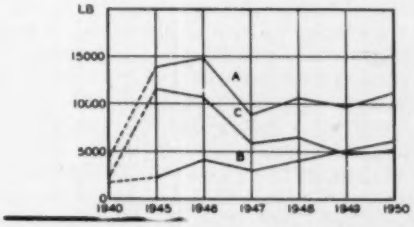


Fig. 2. Amount of chromic acid consumed by electroplating in Atlanta. 1949–1950 data estimated by management. A, total consumption; B, by job shops; C, by plants plating for own use

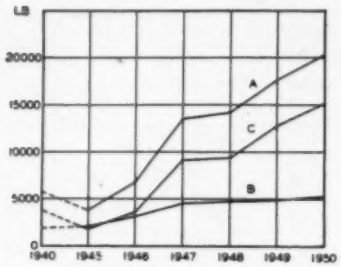


Fig. 3. Amount of copper consumed by electroplating plants in Atlanta. 1949–1950 data estimated by management. A, total consumption; B, by job shops; C, by plants plating for own use

Zinc

Except in 1946, when the consumption of zinc decreased appreciably, the use of this metal expanded throughout the period studied. It is quite probable that the increased use of zinc was due to the higher price of cadmium. Fig. 5 shows the trend in the use of zinc for electroplating.

Tin

There are three plants in the area which reported doing tin finishing. Two of them use the electrodeposition process, and the third uses the hot-dipping method. The two using the plating process began operation since 1945.

The consumption of tin for plating purposes in 1948 approximated 11,000 pounds and is due largely to the demand for plating of refrigerator parts and reconditioning of airplane items. The estimated demand of about 5,500 pounds of tin for plating in 1949 and 1950 is only about one-third of the demand in 1946.

Silver and Gold

Industrial silver plating in the Atlanta area is used primarily for ornamental hardware (e. g., caskets), picture frames, and electrical contact parts. One airline uses silver in plating airplane parts. The volume for the industry as a whole has shown consistent increases since 1940, in which years the consumption was only about 2,400 troy ounces. In 1946, the consumption was about 8,000 troy ounces, and in 1948, it increased further to approximately 13,000 ounces. There was no expected increase in 1949 over 1948. However, in 1950, the estimated consumption is about 16,000 ounces. Practically all industrial silver plating is done in the shops of two companies which plate for their own shop use.

Gold plating is of minor importance in this area. In fact, the entire consumption of gold reported for 1948 was only about 170 troy ounces.

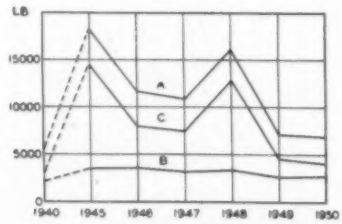


Fig. 4. Amount of cadmium consumed by electroplating plants in Atlanta. 1949–1950 data estimated by management. A, total consumption; B, by job shops; C, by plants plating for own use

Anodizing

Although anodizing is extensively used, no data could be obtained to indicate the volume of business done in this type of finish. It is believed that, with the increasing use of aluminum, anodizing will become an increasingly important finish from the viewpoint of both utilitarian and show purposes.

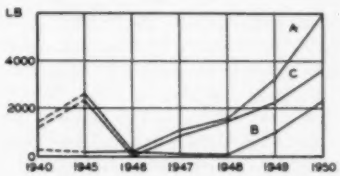


Fig. 5. Amount of zinc consumed by electroplating plants in Atlanta. 1949–1950 data estimated by management. A, total consumption; B, by job shops; C, by plants plating for own use

Consumer Appraisal of the Industry

The original study concerned the Atlanta market for industrial metal finishing by Atlanta producers, and it is deemed relevant to relate some of the comments made by industrial consumers of Atlanta's production of electrodeposited finishes.

As noted in Table I, the number of job shops increased by only two during the period studied, whereas the number of plants producing finishes for their own use almost doubled. There appears to be a trend away from job-shop plating to plating within the plant consuming the finishes. This view is supported by testimony from the management of a number of concerns which have had to install their own plating departments because they could not obtain satisfactory service from the local job shops.

One plant which manufactures industrial machinery had to set up its own metal-finishing department after it was unable to obtain satisfactory quality or cost. Another plant found cadmium plating done by At-

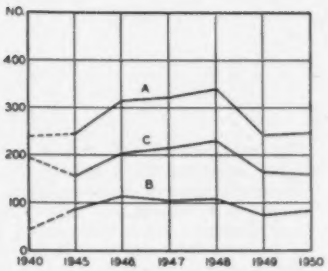


Fig. 6. Average number of plating plant employees in Atlanta. 1949-1950 data estimated by management. A, total; B, in job shops; C, in plants plating for own use

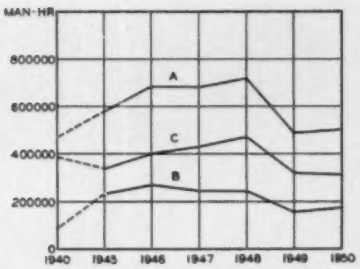


Fig. 7. Number of man-hours worked in electroplating plants in Atlanta. 1949–1950 data estimated by management. A, total; B, in job shops; C, in plants plating for own use

lanta shops defective and the price too high; consequently, it has to set up its own department in 1946. Still another plant reported a similar situation in chromium plating and had to put in its own plating department.

The job-shop business also appears to be handicapped by other deficiencies. One manufacturer, who had discontinued his plating department during the war, undertook to buy his requirements after the war from the job shops in Atlanta to avoid reopening his own department. When he requested prices, for finishing small items which he estimated should cost only $2.00 each, his lowest bid was $12.50—fifty cents more than the $12.00 sale price of his completed product. This man was convinced that most of the local plants are unable to make proper estimates of costs. This judgment seems justified, in as much as only about twenty per cent of all plants doing finishing work in the Atlanta area maintain accurate cost accounting on their operations.

In fact, among the consumers there is widespread complaint of poor quality and high costs of finishing by Atlanta shops. This situation is not at all surprising in view of the lack of technically trained personnel in metal-finishing industry mentioned previously. It is little wonder that several consumers are looking around for other sources of finishes. It would be also interesting to know what complaints the customers of the plants producing for their own use have regarding the finish, in as much as they, too, as a rule lack highly trained personnel.

It was found that a large amount of plating is being done outside the Atlanta area for Atlanta consumers. Several reasons for this have already been mentioned—poor quality and high costs. However, one consumer reported that he did not know that the type of finish he was interested in was produced locally—an indication that the Atlanta metal-finishing industry does not solicit business vigorously.

Employment Trend of the Industry

Fig. 6 shows the trend in the number of employees engaged in metal-finishing operations of the firms within the Atlanta area. The change in the total number of employees over the ten-year period from 1940 to 1950 is rather small, from 237 in 1940 to an estimated 242 in 1950. There was considerable growth during the war and post-war period to meet the increased demand for electroplated finishing. The peak was reached in 1948 when 342 persons were engaged in this industry.

The job shops showed the greater overall increase in employment. In 1940, the three job shops employed 43 workers, reached a peak of 116 in 1946, and the five plants in 1949 expected to employ 80 workers in 1950.

The eight plants which used electroplating in their manufacture in 1940 in that year employed 194 workers for this purpose and reached a peak of 231 in 1948. The fifteen plants of this type in 1949 estimated their manpower needs for 1950 to be 162, which is lower than the 1940 figure for eight plants.

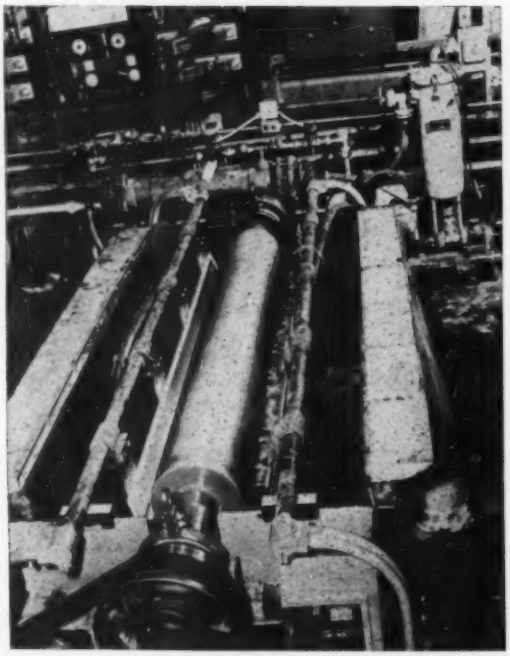
There is relatively little female help used in electroplating operations. In 1940, four women workers were employed. The peak was reached in 1946 and 1947 when forty-three were engaged. The number for 1950 is estimated to be twenty after a decline to eleven in 1949. No job shops reported using female help.

It is interesting to note that even with a slight increase in the number of employees engaged in electroplating operations—the plants which use electroplating for their own consumption and use reported a net decrease over the ten-year period—the industry estimates, in general, a larger output and consumption of chemicals. The increased output with a decreased input of labor is undoubtedly due to increasing use of more efficient methods of production and technique.

The trend in the use of labor is reflected in the number of manhours expended in production. Fig. 7 shows the trend over the 1940–1950 period. The peak for the industry was reached in 1948 when 730,000 manhours were used from the low of 474,000 man-hours in 1940. Since 1948, there has been a decrease and for 1950 the total estimated is 505,000 man-hours.

The rotogravure roll carries two copper layers separated by a passive nickel film. The first copper layer, 0.1–0.125-inch thick, is applied by plating, first in a cyanide bath to a thickness which will protect the steel in the next step, and then in an acid bath. The copper is highly finished in the same manner as the second copper layer, as described below. In this picture, which shows the beginning of the preparation of the roll, the operator starts the stripping of a used second copper layer, called the shell or ballard, from the intermediate nickel film. A later stage of this operation appears on the cover.

ROTOGRAVURE



Most laymen have heard of rotogravure only in connection with the rotogravure section of their Sunday paper, but actually it has much wider application. Many high-circulation magazines, wall paper, labels, textiles, linoleum, to mention only a few, are printed by this process.

The principle of rotogravure printing is simple. The paper passes between two rolls, or cylinders, a lower printing roll carrying the design and an upper roll supplying the pressure. The former has the image etched into it to form depressed areas, or wells, carrying the printing ink. Every well has the same surface size and shape, but the depth varies, and the deeper wells hold and give off more ink and print the darker shades. Because the number of wells is very large, often 20,000–25,000 per square inch, and the ink spreads somewhat on the paper surface, a continuous tone is obtained. The process, therefore, lends itself particularly well to faithful reproduction of illustrations.

The printing roll is usually constructed of a steel tube mounted on a shaft. Its surface is sup-

The 0.006–0.008-inch copper shell is deposited in either a copper sulfate or a copper fluoborate solution, both of which contain addition agents which promote the formation of a fine-grained deposit. The cylinder is rotated at 160 rpm during plating. A roll 76 inches long and 35 inches in diameter is plated with 1,600 amperes with the solution being maintained at 110° F by external heat exchanger and filtered continuously.

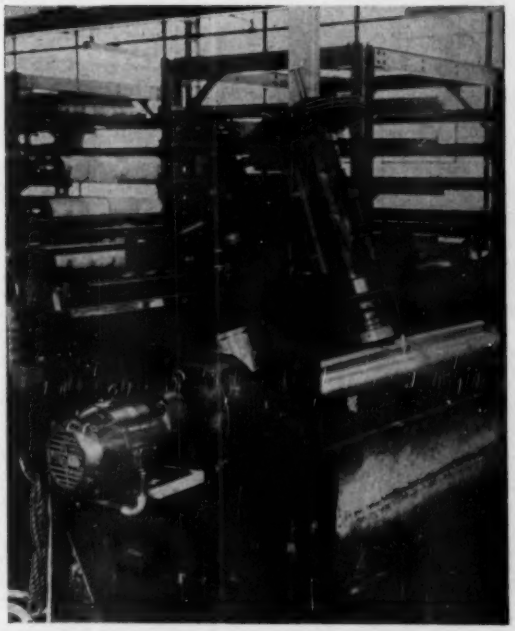
A little of the nickel is removed with the shell. About every fourth shell, the operator applies a solution of nickel sulfate with suspended mild abrasive to renew the nickel film. This film is then passivated.

ROLL MAKING

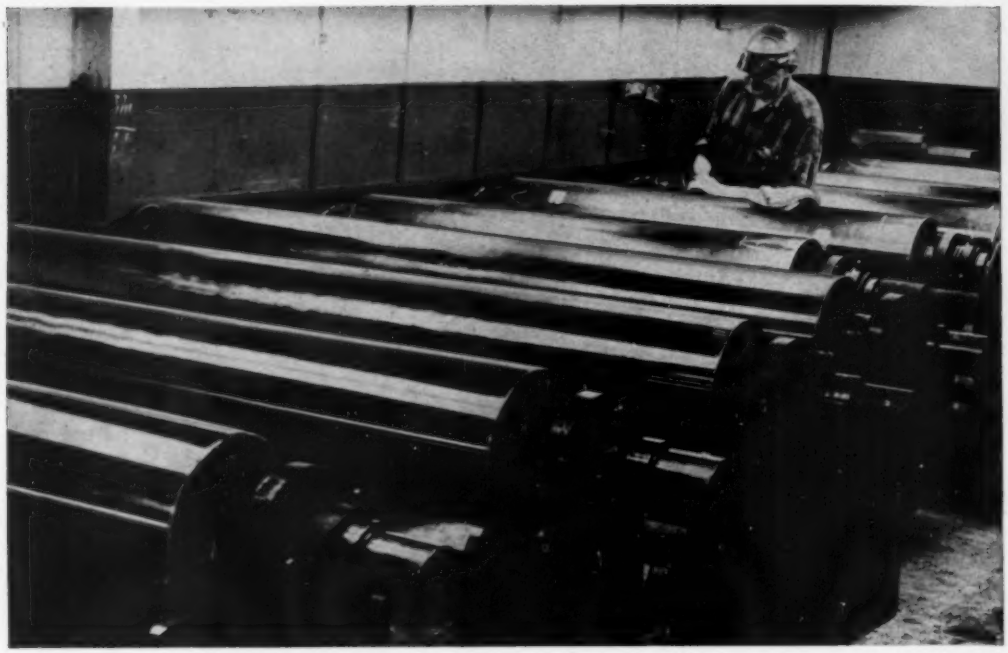
plied with a smooth coating of copper into which the design is etched.

The text and the artwork is photographed and the negatives retouched. They are then assembled and a single positive is made and retouched in turn. The positive is then brought into contact with and printed photographically on a sheet of sensitized gelatin "carbon tissue" with a previously printed gravure screen. In the printing, the bichromated gelatin hardens the most where the light is the strongest, i. e., at high lights and especially at the screen lines. From here on the pictures tell the story.

These pictures and an outline of the processing stages have kindly been furnished by Mr. J. H. Molitor, Vice-President and General Superintendent of the Art Color Printing Company, Dunellen, N. J., eastern subsidiary of the W. F. Hall Company of Chicago. The combined companies are the world's largest printers of magazines and mail-order catalogues, using both letterpress and gravure processes.

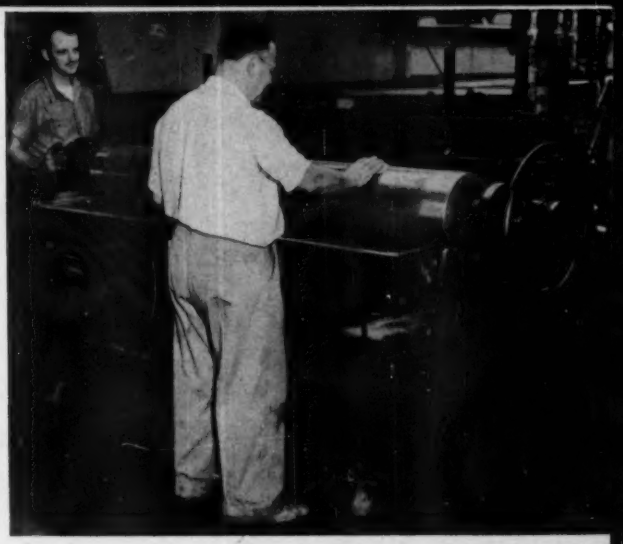


The copper surface is ground and polished, first with abrasive stones of successively finer grit and then with abrasive cloth.



Polished cylinders are inspected, and small defects corrected by an engraver. Any small holes may be filled with silver amalgam or, if the etched copper roll is to be chromium plated, with lead.

The exposed carbon tissue described in the introduction is made to adhere to the polished cylinder by means of water and a squeegee roller.

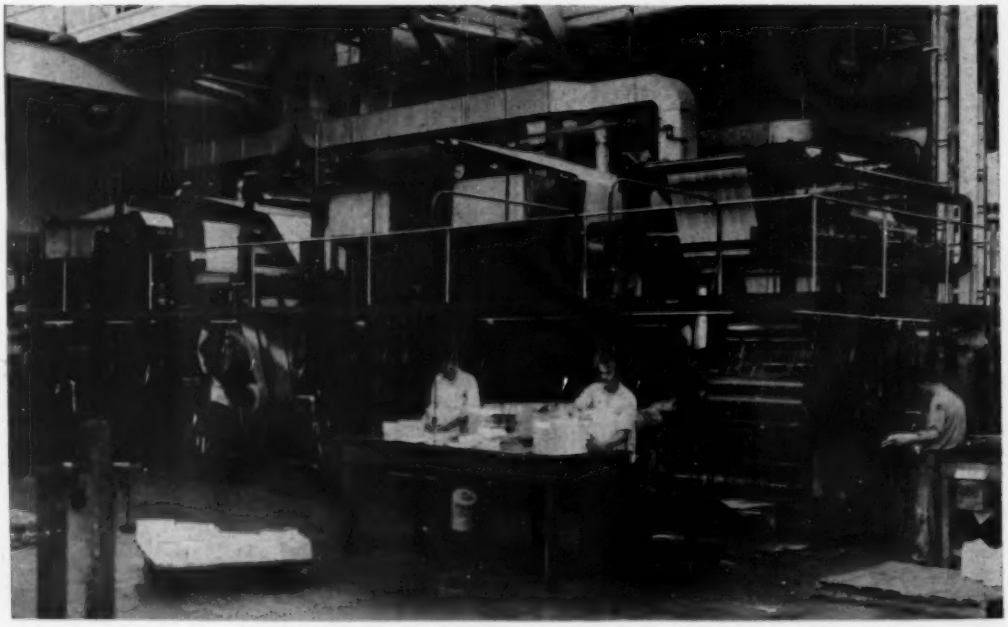


The cylinder with the carbon tissue is immersed in water, the paper backing stripped off, and the image developed. The unexposed gelatin dissolves completely, the exposed and hardened gelatin in proportion to its hardness, and the screen lines hardly at all. The developed image consists of squares of gelatin of varied height between the screen lines.

In the "staging" of the cylinder those portions which are not to be etched are painted with an asphaltum resist. These portions may be the type, rules, or other parts that one may wish to etch separately for better overall control of the etching, or they may be portions devoted to different colors.

An iron chloride solution is used for etching the copper. The solution penetrates the gelatin "cubes" at a rate depending on their heights, i. e., the darkest portions on the original are penetrated first and the highlights last. The screen lines and the resist are not attacked. The maximum depth of the etch depends on the time, temperature and concentration of the etchant. Finally the resist is washed off with xylol and naphtha and the residue of photographically exposed tissues with salt and water.

The cylinder is now press-proved, and any minor errors corrected by hand engraving, re-etching to deepen color, or buffing to lighten it. The picture shows (left) the exit side of the paper where the cylinder is sprayed with ink; and (right) where the paper enters and where excess ink is scraped off by the doctor blade.



In the printing press are mounted one roll for each color, e. g., four-color work in yellow, red, blue and brown or black requires four cylinder. The press shown here is a modern two-color press operating at about 1,000 feet per minute. The paper enters at the left and leaves at the right in the form of folded "signatures" ready for binding.

GOVERNMENT SPECIFICATIONS

As the Nation moves into defense production, the plant man, including the plater, will be confronted with the problems of meeting Government specifications.

Frequently he simply receives a specification designation without being informed of the name of the agency which has issued it. In trying to obtain the specification, he soon finds that a part being manufactured for a certain Government department is not necessarily controlled by that department's specifications. For example, aircraft parts for the Bureau of Aeronautics of the Navy Department may have to meet requirements of Federal Specifications, Military Specifications, Joint Army-Navy Specifications, Army-Navy Aeronautical Specifications, Air Force Specifications, yes, even specifications issued by American Society for Testing Materials, American Standards Association, Society of Automotive Engineers, or other industrial bodies.

Every effort is being made to have the Armed Forces and civilian agencies use Federal Specifications wherever applicable. Only if there is no applicable Federal Specification should they use their own. In spite of this, the Armed Forces are reported to have about 25,000 specifications of one kind or the other.

It is the purpose of this article to help identify the most commonly encountered Government Specifications.

Federal Specifications

The designations for these specifications consist of three or four parts: (1) one, two, or three capital letters (all the same) indicating the class of product, followed by a hyphen, (2) a single capital letter identical with the first letter in the title, followed by a hyphen, (3) a number indicating the alphabetical order within each group having the same preceding letters, and (4) a small letter indicating the revision (a = first revision, b = second revision, etc.). For example, in QQ-I-676b for Iron, Pig, Foundry, QQ stands for Metals, I for Iron, 676 is the number within class QQ-I, and b shows that this is the second revision.

Armed Forces Specifications

Military Specifications

All new specifications issued by the military are designated MIL Specifications. Eventually all specifications of the military agencies will be of this kind.

The usual designation consists of the letters MIL followed by a hyphen, a capital letter which is the first letter of the title, followed by a hyphen, and a serial number. A prefix R indicates a restricted classification, a prefix C a confidential classification. Thus C-MIL-R-15250 is a confidential specification for "Radiac system, shipboard".

Joint Army-Navy Specifications

These specifications are designated simply by the letters JAN followed by a hyphen and a number.

Army-Navy Aeronautical Specifications

The designation of the older specifications is according to the Federal Specification system except for a prefix AN. For example, in AN-QQ-S-646 for Steel; Carbon (1020, x 1020 and 1025), Bar-and-Rod, AN stands for Army-Navy Aeronautical, QQ for Metal, S for Steel, and 646 is the alphabetical order within class AN-QQ-S.

Newer specifications drop the main-class designation. For example, in AN-S-5, AN and S have the same meaning as above, and 5 is the serial number within class AN-S.

U. S. Army Specifications

A class number followed by a hyphen, a serial number, and a capital letter indicating the number of the revision constitutes the simplest system of designation. Thus in 3-120C, 3 represents Class 3, Paints; 120 the serial number and C the third revision.

A more complicated system exists in addition, in which (1) the class number and hyphen is followed by (2) a number indicating the alphabetical order of titles and a hyphen, and then (3) by the serial number and, when required, the capital letter designating revision. Specification 4-503-440A for Zinc Dust is of this type, the first figure 4 standing for Class 4, Chemicals.

U. S. Army Tentative Specifications

The various Army services, such as the Chemical Warfare Service and the Ordnance Department, have used the Army specification system for regular specifications, but have had their own tentative specifications.

Chemical Warfare Service uses the U. S. Army number system preceded by a simple serial number.

Corps of Engineers number its tentatives serially, prefixing the serial number by T for its Supply Division and by E for its Construction Division.

Quartermaster Corps tentatives begin with the initial of the issuing depot and follow with a serial number.

Ordnance Department uses a similar system, beginning with the initial (one or two letters) of the issuing arsenal and following by the letters XS and the serial number.

Signal Corps tentatives are always marked "Signal Corps Specification". No fixed system seems to be used.

Engineer Board uses the letters EPB followed by a serial number.

Medical Corps tentatives begin with SLMD for St. Louis Medical Procurement District or by NYGD or NYMD for New York Medical Depot and are then numbered serially from 100 up.

U. S. Navy Specifications

The regular Navy Specifications are designated by (1) a number designating class, (2) a capital letter which is the first letter in the name of the article, (3) a serial number, and (4) a small letter designating the revision if any. For example, in 46 P 2, the figure 46 is for Class 46, Metals, and P is the initial of Plating.

Bureau of Ships, Bureau of Supplies and Accounts and *Bureau of Medicine and Surgery* issue Ad Interim Specifications which carry the Navy symbol and is followed by (Int.) and date.

Marine Corps specifications are not numbered but identified by title and date of issuance.

Naval Aircraft Factory specifications begin by the letters EMS which are followed by a serial number.

U. S. Air Forces Specifications

Tentative specifications are designated by a 4- or 5-digit serial number, sometimes prefixed by USAF.

Civilian Specifications

Civil Aeronautics Administration

The letters CAA followed by a number designate these specifications.

Veterans Administration Specifications

These specifications begin with the letters VA. Following a hyphen and one or two letters designating class there is another hyphen, a number, a hyphen and a small letter to indicate revision.

Commercial Standards, Simplified Practice Recommendations

These are now issued by the Commodity Standards Division, Office of Industry and Commerce, Department of Commerce. The letters CS followed immediately by a serial number, then a hyphen, and finally two numbers indicating year of adoption, stand for a Commercial Standard.

Simplified Practice Recommendations are designated by the letter R, a hyphen, a 1-, 2- or 3-digit number, another hy-

(*Continued on page 254*)

BUFFALO

1951 A.E.S. Convention City

MONDAY, JULY 30 — THURSDAY, AUGUST 2

At the Executive Board meeting in Chicago on January 26, the holding of a Convention in Los Angeles was postponed indefinitely. Both the Executive Board and the Los Angeles Branch had for some time given this matter a great deal of thought. Both, independently, reached the same conclusion, namely, that it would not be in the best interest of the Society to hold the Convention in Los Angeles this year, in view of the National emergency and its serious effect on the plating industry.

The dual problem then arose of finding, quickly, a Branch which would be willing and enthusiastic to organize a Convention within the available time and to run it, in a Convention city which could satisfy the requirements for hotel space.

Fortunately suitable hotel space was found in Buffalo, N. Y., in Statler Hotel, on July 30–August 2, and the Buffalo Branch obliged the Society by voting unanimously to become the Host Branch. Whereas the available date is later than usual, it appears to be a happy compromise, because we are informed that nights are always cool in Buffalo in summer, and there are many attractions for summer vacationists in the vicinity of the city.

Applications for hotel reservations and instructions will be mailed to all members in March, and will also be published in the April issue of PLATING.

At a special meeting of representatives of the Buffalo Branch on February 10, a preliminary report of the technical program as prepared by the Editorial Board was presented by the Executive Secretary, and plans were discussed for the entertainment programs for both men and women.

The following Convention Committee chairmen were appointed, who immediately began to organize their respective committees and activities:

General Chairman—BERT KIRCHOFF, Jamestown Electro Plating Company
Co-Chairman—DR. C. J. WERNLUND, Electrochemicals Dept., E. I. du Pont de Nemours & Company
Co-Chairman—W. M. FOTHERINGHAM, Fotheringham Plating Supplies
Educational Chairman—STANLEY BUSH, Bush Brothers Plating
Registration Chairman—WILLIAM D. HART, Sylvania Radio & Television Corporation
Hotel Reservation Chairman—B. P. FORTIN, JR., Oakite Products, Inc.
Program Chairman—H. A. FUDEMAN, Trico Products Corporation
Entertainment Co-chairmen—JOSEPH RUFF, Trico Products Corporation, and J. MONEYPENNY, Barcalo Manufacturing Company
Publicity Chairman—JOAN T. WIARDA, Finishing Publications, Inc.
Banquet Chairman—J. MONEYPENNY
House Chairman—ANTHONY NIGRO, Sterling Silver Plating Works
Outing Chairman—JOSEPH RUFF
Ladies' Chairman—MRS. ALICE NIGRO
Reception Chairman—W. M. FOTHERINGHAM
Transportation Chairman—LEON A. NOWAK, Star Plating Works

Government Specifications

(*Continued from page 253*)

phen, and the last two digits of the year of adoption.

SOURCES OF SPECIFICATION COPIES

Every contractor or subcontractor should make certain that he has an authenic copy of the correct specification. As a rule it can be furnished by the government inspector of the particular item.

Federal Specifications and Index to Federal Specifications may be obtained at cost from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

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Many military specifications can be obtained from Department of Defense, Standards Branch, GH-Logistics, Pentagon Building, Washington 25, D. C.

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All confidential and restricted specifications must be obtained through the inspector for the service in question.

Specifications of civilian agencies may be had by application to the agency, Washington 25, D. C.

ACKNOWLEDGMENT

Thanks are due Dr. William Blum and Mr. Fielding Ogburn, of the National Bureau of Standards, who furnished much of the information contained herein.

Cleaning and Preparation of Metals for Electroplating

1. Critical Review of the Literature

H. B. Linford and E. B. Saubestre

Errata

The caption for Fig 1 (p. 60) should read:

"Fig. 1. Titration curves[1]. Various 1 per cent solutions titrated against 1-N HCl".

The word "inherent" on line 8 from the bottom of column 3, page 64, should be "adherent".

We regret these errors, which appeared in the January, 1951, issue.

Methods for Testing Thickness of Electrodeposits

II. COMPARISON OF METHODS FOR NICKEL ON STEEL

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Introduction

The literature on thickness testing is replete with investigations wherein the accuracy and reproducibility of an individual method have been extensively studied. There are, however, remarkably few instances where a single coating on a given basis metal has been subjected to the tests applicable to that coating with the object of comparing the various methods with each other. The information obtained from such an investigation should be of considerable practical significance in that it would enable one to make the most significant selection from amongst the methods which have been suggested for a particular coating and basis metal.

In the case of nickel on steel, only one investigation of the kind mentioned above has been found in the literature. Egginton[1] in England studied eight methods of determining the thickness of nickel plated from a Watts nickel bath on steel, namely, increase in weight, ARD magnetic test, BNF jet test, Mesle's chord-grinding test, microscopic measurement of the section, microscopic measurement of the section of a specimen with protected edges, micrometer measurement of increase in section thickness, and micrometer measurement of the peeled coat. It is difficult to interpret the results of this investigation. None of the original data are given, and the plated panels were prepared in a manner that is open to serious question. The author, in his resume, states that correction factors ranging from 0.13 to 1.12 must be applied in order to correct the indicated thickness to true thickness. He also shows that the "mean variation" within a single method ranges from ±1.5 per cent for micrometer measurements by difference in readings on the plated and unplated steel to ±20 per cent for the microscopic method when specimens are mounted in plastic without overplating for edge protection (±15 per cent when overplating is used). A plot of thickness values obtained by the various methods against thickness by chemical analysis shows a linear relationship for all methods except micrometer measurements of the peeled coating. The slope of each line is different from that of any of the others, and the total range of variation is considerable.

It was evident from Egginton's work as well as from practical experience that a comparison of the several methods under carefully controlled conditions was still necessary. Furthermore, the ARD magnetic tester is not used in this country and should be replaced by the Magne-gage.

The general plan of attack for the work described herein involved the preparation of a series of panels in duplicate with a variety of coating thicknesses encompassing the range of thickness likely to be encountered in decorative and protective plating practice, the measurement of these coating thicknesses by the applicable methods in such a way that they yield data reflecting the precision and the reproducibility of the results, and an analysis of the data.

The following methods were selected for comparison: Magne-gage, BNF jet test, microscopic method, stripping and cathode gain in weight (calculated). These represent the methods for nickel on steel

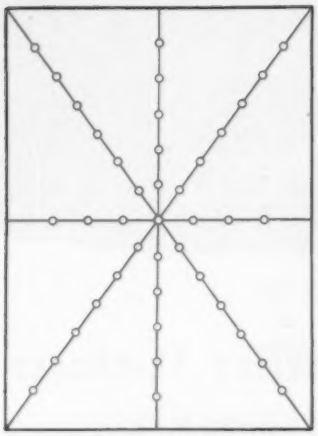

Fig. 1. Locations of test points for nondestructive thickness tests

which have gained some measure of general acceptance and usage. It was decided that the thickness of the plated nickel should range from 0.0001 to 0.005 inch (2.5 to 127 μ), and that eight sets of duplicate panels should be prepared with the following nominal thicknesses: 0.0001, 0.0003, 0.0005, 0.0008, 0.001, 0.002, 0.003 and 0.005 inch (2.5, 7.6, 13, 20, 25, 51, 76 and 127 μ).

All measurements were made by a single operator; hence, the human factor should be uniform throughout the work. It was not deemed necessary or desirable to distribute panels to other operators inasmuch as this would be a duplication of the work currently being carried out by A. S. T. M. Committee B-8, Subcommittee III, Section A.

Experimental Methods

A considerable amount of preliminary work had established that it was possible to deposit nickel with a high degree of uniformity of thickness under the conditions and with the technique to be described below.

Eight sets of duplicate panels were prepared according to the requirements set forth above. The two panels for a single thickness category bear the same serial number but are differentiated by appended capital letters.

Preparation of Plated Panels

All panels were plated from a Watts-nickel bath under the following conditions:

$NiSO_4 \cdot 7H_2O$	200 g/l (27 oz/gal)
$NiCl_2 \cdot 6H_2O$	45 g/l (6 oz/gal)
H_3BO_3	30 g/l (4 oz/gal)
Current Density	20 asf (2.2 amp/dm²)
Temperature	55° C (131° F)
*p*H	5.2 (glass electrode)
Agitation	See below
Anode	Rolled, depolarized nickel

Technical-grade chemicals were dissolved in distilled water, and the solution was purified by the following method. It was heated to 95° C (203° F), 15 g/l (2 oz/gal) $NiCO_3$ and 50 ppm H_2O_2 (by weight) were added, and after stirring for one hour, 5 g/l (0.7 oz/gal) of activated carbon was added. Stirring was continued for one-half hour at the elevated temperature, after which the solution was cooled to room temperature and filtered through high-retentivity paper. After the *p*H had been adjusted with sulfuric acid, the solution was electrolyzed at operating temperature with mild agitation for 24 hr at 2 asf (0.22 amp/dm²) and 24 hr at 5 asf (0.55 amp/dm²). Evaporation losses were replaced with distilled water. The anode was bagged with Vinyon No. 1. Pitting was controlled with hydrogen peroxide except in the case of panel 8C where Duponol ME was used.

The plating was carried out in a cylindrical Pyrex jar 10 inches (25 cm) deep and 8.5 inches (22 cm) in diameter which held approximately 8 l (2 gal). The solution was heated with an infra-red lamp, and the temperature controlled by regulating the distance of the lamp from the jar. If the ambient temperature of the room does not vary widely and suddenly, this technique affords excellent control without cluttering the bath with a regulator and an immersion heater. The cathode was enclosed in a Lucite box of the open-front type described by Mohler and Schaefer[2] which would accommodate panels 4 inches (10 cm) wide. The cathode was immersed to a depth of 6 inches (15 cm). The depth of the box was 1.5 times the width, as recommended by Mohler and Schaefer[2]. A 4 x 7-inch (10 x 17.5-cm) anode was suspended opposite the open side of the cathode box, and a propeller-type agitator was located outside the box, midway along one side and near the bottom of the jar. The propeller was driven at low speed (300 rpm), and provided rather mild agitation, particularly within the box. Extensive preliminary tests proved that the whole of the nickel deposit on the 4 x 6-inch (10 x 15-cm) area was of uniform thickness, or at least as uniform as the reproducibility of any method of measuring the thickness.

The basis metal for all panels was low-carbon, cold-rolled steel which was about 0.035-inch (0.9-mm) thick, and had a No. 3 finish. All specimens were taken from the same coil, and those having scratches or other defects were rejected. There was no polishing or buffing of the basis metal.

Preparation of Specimens for Individual Tests

Magne-gage measurements were made on each panel as a whole before it was cut into separate specimens. Fig. 1 shows the location of each of the 41 test spots for Magne-gage readings. This lay-out, which had proved useful in other work, reveals both closely spaced and widely spaced thickness variations if such be present in the panel.

Specimens for the destructive test methods were obtained by sawing the original panel into 24 pieces with a 32-pitch band saw. Each piece measured 0.75 x 0.75 inch (1.9 x 1.9 cm), and when the sawing is done with care under a magnifying glass excellent geometric and dimensional regularity can be achieved. The outer edge of the panel was not used. Each specimen was numbered on the back, starting with the upper left-hand corner of the panel as viewed from the front, proceeding horizontally to the right and thence to the left-hand specimen in the next row, and so on for the six rows. The 24 specimens from each panel were randomized into 4 groups of 6 each, as follows:

Group I:	Nos. 1, 10, 23, 4, 13, 22
Group II:	Nos. 7, 8, 21, 14, 19, 24
Group III:	Nos. 17, 2, 15, 16, 5, 18
Group IV:	Nos. 11, 20, 9, 6, 3, 12

The randomizing was done according to the technique described by Fisher[3]. Only 5 specimens were used for each destructive test, the highest-numbered specimen in each group being reserved for check purposes, if needed.

Magne-gage Measurements

The Magne-gage used in this work was carefully checked by the National Bureau of Standards to insure that the instrument was in proper working order and would yield results which were truly representative of what can be expected from the gauge. It should be emphasized that the instrument was in no way specially adjusted or otherwise modified so that it would no longer represent a typical gauge.

The instrument was used in strict accordance with the operating instructions furnished with it, and the calibrations were checked against the standards which accompanied the gauge. It might be mentioned that these standards were checked against others which were available. The correlation was excellent.

Each Magne-gage measurement reported herein is based on at least three flips. If close agreement in dial readings was not obtained with three flips, additional flips were taken until well-agreeing dial readings were obtained. The surfaces of the specimens were sufficiently smooth that successive flips gave dial readings as concordant as those obtained on the standards which were used to calibrate the instrument.

No special precautions were required to protect the gauge against vibration because it was used in a building which is far removed from trolley, railroad or heavy-truck traffic and where internal vibration is limited to insignificant sources. In this respect the instrument

TABLE I. MAGNE-GAGE DATA FOR NICKEL-ON-STEEL

(All Measurements in Hundred-Thousandths Inch)

Panel Number	Thickness X	Frequency	Statistical Data*	Panel Number	Thickness X	Frequency	Statistical Data*
Ni-5A.....	14	3	n = 41	Ni-7B.....	89	1	n = 41
	13	25	$\bar{X}$ = 12.8		88	5	$\bar{X}$ = 85.7
	12	13	σ = 0.57		87	6	σ = 1.51
					86	8	
Ni-5B.....	14	14	n = 41		85	12	
	13	25	$\bar{X}$ = 13.3		84	6	
	12	3	σ = 0.58		83	3	
Ni-6A.....	33	12	n = 41	Ni-2A.....	115	7	n = 41
	32	17	$\bar{X}$ = 32.0		114	5	$\bar{X}$ = 112.7
	31	10	σ = 0.85		113	12	σ = 1.62
	30	2			112	9	
					111	2	
Ni-6B.....	34	11	n = 41		110	5	
	33	17	$\bar{X}$ = 32.9		109	1	
	32	10	σ = 0.89				
	31	3		Ni-2B.....	123	1	n = 41
					122	10	$\bar{X}$ = 119.1
Ni-1A.....	65	10	n = 41		121	7	σ = 2.91
	64	17	$\bar{X}$ = 63.6		120	6	
	63	4	σ = 1.14		119	2	
	62	9			118	3	
	61	1			117	5	
					115	4	
Ni-1B.....	65	4	n = 41		113	2	
	64	16	$\bar{X}$ = 63.1		112	1	
	63	6	σ = 1.21				
	62	12		Ni-3A.....	202	1	n = 41
	61	2			201	1	$\bar{X}$ = 193.8
	59	1			200	2	σ = 3.04
					197	1	
Ni-7A.....	92	1	n = 41		196	7	
	91	1	$\bar{X}$ = 87.7		195	3	
	90	1	σ = 1.54		194	2	
	89	8			193	5	
	88	12			192	13	
	87	9			191	1	
	86	5			190	4	
	85	4			189	1	

*n = number of measurements, $\bar{X}$ = arithmetical average, σ = standard deviation[1].

was used under conditions which might not prevail in many industrial plants.

Microscopic Thickness Measurements

The specimens were prepared as follows:

(a) Mount all specimens of a group in steel clamps with annealed-brass pads against each nickel surface. Suitable clamps may be made of 0.25 x 0.5-inch (0.63 x 1.3-cm) steel, fastened together with 10–32 machine screws and nuts.

(b) Machine 0.1 inch (0.25 cm) from the face of the mount. Precautions must be observed to keep the plane of preparation perpendicular to the nickel surface.

(c) Grind successively on Nos. 1, 0, 00, and 000 emery paper. This may be done either by hand or machine.

(d) Polish on a canvas wheel with 600-grit aluminum oxide abrasive suspended in water.

(e) Polish on a Selvyt-cloth wheel with optical rouge suspended in water. Those who object to staining their hands with rouge can use 15-min levigated alumina.

(f) Etch first with 2 per cent nital (2 ml HNO_3 in 98 ml C_2H_5OH), then in a solution of concentrated ammonium hydroxide and 3 per cent hydrogen peroxide in the ratio of 5 to 2 by volume.

(g) Examine for evidence of flowed metal—if found, go back to step (d).

(h) Measure when interfaces are clear and sharp, and there is no evidence of flowed metal.

Measurements were made with a metallurgical-type bench microscope equipped with an objective and a filar eyepiece which together gave a magnification of about 500. Equipment which would provide higher magnification was available, but was not used because inquiry and experience revealed that most plating establishments are not equipped for *effective* work at higher powers. The limits of resolution attainable with visual light make it likely that magnifications above 500 are useful only for possible ease of manipulation, and do not permit any real increase in precision provided that the work at 500 is done with a *properly adjusted* optical system of high quality. The filar eyepiece was calibrated against a stage micrometer which had been compared carefully with several others manufactured by three different concerns. All gave the same calibration within the limits of observational error.

Each specimen in a group was measured at four locations; hence, twenty

TABLE II. MICROSCOPIC DATA FOR NICKEL-ON-STEEL

(All Measurements in Hundred-Thousandths Inch)

Panel Number	Thickness X	Frequency	Statistical Data*
Ni-5A	14.9	4	n = 20
	13.2	12	$\bar{X}$ = 13.2
	11.6	4	σ = 1.04
Ni-5B	14.9	2	n = 20
	13.2	16	$\bar{X}$ = 13.2
	11.6	2	σ = 0.74
Ni-6A	29.8	7	n = 20
	28.1	9	$\bar{X}$ = 28.4
	26.5	4	σ = 1.20
Ni-6B	33.1	2	n = 20
	31.4	10	$\bar{X}$ = 30.8
	29.8	6	σ = 1.32
	28.1	2	
Ni-1A	66.2	1	n = 20
	64.5	1	$\bar{X}$ = 60.2
	62.9	4	σ = 2.54
	61.2	1	
	59.6	5	
	57.9	8	
Ni-1B	59.6	1	n = 20
	57.9	6	$\bar{X}$ = 56.5
	56.3	8	σ = 1.56
	54.6	4	
	53.0	1	
Ni-7A	89.4	1	n = 20
	86.1	9	$\bar{X}$ = 85.2
	84.4	8	σ = 1.44
	82.8	2	
Ni-7B	89.4	1	n = 20
	87.7	3	$\bar{X}$ = 83.8
	84.4	1	σ = 2.29
	82.8	13	
	81.1	2	
Ni-2A	112	8	n = 20
	111	3	$\bar{X}$ = 110.3
	109	5	σ = 1.15
	108	4	
Ni-2B	116	2	n = 20
	114	11	$\bar{X}$ = 113.5
	113	4	σ = 1.32
	111	3	
Ni-3A	217	2	n = 20
	215	2	$\bar{X}$ = 211
	213	3	σ = 3.11
	212	4	
	210	2	
	209	5	
	207	1	
	205	1	
Ni-3B	250	2	n = 20
	248	1	$\bar{X}$ = 244
	247	3	σ = 3.16
	245	5	
	243	4	
	242	2	
	240	2	
	238	1	
Ni-4A	346	2	n = 20
	344	1	$\bar{X}$ = 333
	341	1	σ = 6.20
	334	1	
	333	4	
	331	2	
	329	4	
	328	3	
	326	2	
Ni-4B	331	2	n = 20
	328	3	$\bar{X}$ = 323
	326	2	σ = 4.60
	323	5	
	319	3	
	318	3	
	316	2	
Ni-8A	579	1	n = 20
	549	1	$\bar{X}$ = 536
	540	2	σ = 11.02
	536	1	
	535	4	
	533	3	
	531	3	
	530	2	
	528	2	
	526	1	
Ni-8C	549	1	n = 20
	546	2	$\bar{X}$ = 539
	544	2	σ = 5.94
	543	4	
	541	1	
	540	1	
	538	1	
	536	3	
	535	2	
	533	2	
	523	1	

*See footnote for Table I.

measurements were made on each group.

The BNF Jet Test

This test was executed substantially according to the directions of Clarke[4]. It has been found, however, that the rather elaborate shielded jet tube described by him is not necessary for reliable results. The jet which was used for measurements reported herein was made from 1.5-mm capillary tubing and conformed to Clarke's specifications with respect to delivery rate, namely, 10 ml in 30 sec. All other specifications for the test were rigidly observed, and the following solution was used:

Ferric chloride,
$FeCl_3 . 6H_2O$.....300 g/l (40 oz/gal)

Copper sulphate,
$CuSO_4 . 5H_2O$..100 g/l (13.3 oz/gal)

TABLE III. JET TEST DATA FOR NICKEL-ON-STEEL
(All Measurements in Hundred-Thousandths Inch)

Panel Number	Thickness X	Frequency	Statistical Data*
Ni-5A	12.2	1	n = 20
	12.0	3	$\bar{X}$ = 10.9
	11.9	1	σ = 0.54
	10.9	3	
	10.8	5	
	10.7	4	
	9.7	1	
	9.5	2	
Ni-5B	13.6	3	n = 20
	12.8	5	$\bar{X}$ = 12.5
	12.7	6	σ = 0.55
	12.5	1	
	11.6	3	
	11.5	1	
	10.4	1	
Ni-6A	29.4	2	n = 20
	28.6	3	$\bar{X}$ = 27.6
	28.2	6	σ = 0.81
	27.4	2	
	27.1	1	
	26.2	3	
	25.9	3	
Ni-6B	31.0	1	n = 20
	30.2	1	$\bar{X}$ = 28.8
	29.8	9	σ = 1.11
	29.0	1	
	28.6	2	
	27.8	2	
	26.3	3	
	25.1	1	
Ni-1A	58.2	3	n = 20
	56.9	1	$\bar{X}$ = 52.9
	54.1	1	σ = 2.06
	53.5	2	
	52.7	2	
	52.6	2	
	52.1	1	
	51.4	2	
	51.2	2	
	50.8	1	
	48.6	3	
Ni-1B	56.8	2	n = 20
	55.4	3	$\bar{X}$ = 53.6
	54.1	7	σ = 1.24
	52.7	2	
	51.4	6	
Ni-7A	84.5	3	n = 20
	82.1	1	$\bar{X}$ = 78.5
	80.9	1	σ = 2.32
	79.7	4	
	78.0	2	
	77.3	3	
	75.6	2	
	75.1	1	
	73.9	3	
Ni-7B	85.5	1	n = 20
	84.5	1	$\bar{X}$ = 82.3
	84.2	4	σ = 1.14
	82.9	1	
	82.1	4	
	81.7	4	
	80.9	1	
	80.5	2	
	79.7	2	
Ni-2A	109	1	n = 20
	108	2	$\bar{X}$ = 103.6
	107	1	σ = 1.97
	106	2	
	105	2	
	103	4	
	102	1	
	101	5	
	100	2	
Ni-2B	112	2	n = 20
	110	1	$\bar{X}$ = 106.4
	109	1	σ = 2.24
	108	4	
	107	4	
	106	2	
	104	2	
	103	1	
	101	3	
Ni-3A	228	1	n = 20
	225	2	$\bar{X}$ = 217
	222	1	σ = 3.96
	220	3	
	219	1	
	218	2	
	216	2	
	214	2	
	213	1	
	212	1	
	211	2	
	208	1	
	206	1	
Ni-3B	297	1	n = 20
	294	1	$\bar{X}$ = 280
	290	1	σ = 5.86
	287	1	
	286	2	
	285	1	
	284	1	
	280	3	
	278	1	
	277	2	
	276	1	
	271	2	
	269	1	
	267	2	
Ni-4A	363	1	n = 20
	354	1	$\bar{X}$ = 340
	351	3	σ = 7.52
	349	1	
	347	2	
	346	1	
	344	1	
	337	1	
	335	1	

TABLE III. JET TEST DATA FOR NICKEL-ON-STEEL (*Continued*)
(All Measurements in Hundred-Thousandths Inch)

Panel Number	Thickness X	Frequency	Statistical Data*	Panel Number	Thickness X	Frequency	Statistical Data*
	332	1			495	1	
	330	2			493	2	
	329	2			483	1	
	328	2			477	2	
	327	1			474	1	
					472	1	
Ni-4B.....	347	3	n = 20				
	344	5	$\bar{X}$ = 342	Ni-8C.....	643	1	n = 20
	342	4	σ = 2.57		636	1	$\bar{X}$ = 617
	339	4			635	1	σ = 12.28
	337	3			633	2	
	334	1			631	1	
					630	1	
Ni-8A.....	558	1	n = 20		625	1	
	555	1	$\bar{X}$ = 513		622	1	
	551	1	σ = 17.93		621	1	
	542	1			618	2	
	535	1			617	1	
	533	1			615	2	
	528	1			604	1	
	526	1			594	1	
	525	1			589	1	
	522	1			587	1	
	518	1			579	1	
	516	1					

*See footnote for Table I.

Each of the five specimens from a given panel was tested in four spots—the maximum number that could be conveniently located on the individual specimens. This procedure gave twenty individual tests for each panel.

In order to avoid using significant specimens to locate approximately the end-point for specimens of a given thickness, scraps from the edge of each panel were used in making preliminary tests wherein the end-point for that panel would be located to within a small fraction of the time required for penetration of the deposit. This procedure is desirable because if it is necessary for the operator to stop many times during the execution of a single test to observe the progress of metal removal, the cumulative errors of timing may become excessively large.

The solutions used for all tests were comparatively fresh and were stored in the room where the tests were to be made for a sufficiently long period of time that the temperature of the solution would be the same as that of the room. The factor for penetration time vs thickness was taken from Clarke's paper, as was the correction for temperature.

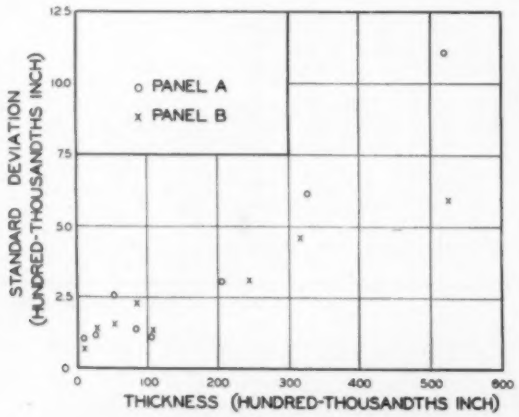

Fig. 2. Relationship between standard deviation and thickness for the microscopic method

Stripping Tests

The specimens selected for this test were deburred with a fine, flat file. The burrs were all on the steel side; hence their removal did not affect the deposit. Each specimen was then measured at several places in both directions with a vernier caliper, and the average dimensions determined. It was established that this procedure gave results for area calculations which were comparable in accuracy to the weight-loss measurements which could be made with a high-grade analytical balance.

A considerable amount of experimentation was required to establish a stripping procedure which was both reasonably fast and free from attack on the steel basis metal. It was found that best results were obtained when red, fuming nitric acid was used as a stripping agent. Stripping times were still long (24 hr for the

TABLE IV. STRIPPING DATA FOR NICKEL-ON-STEEL
(All Measurements in Hundred-Thousandths Inch)

Panel Number	Thickness X	Frequency	Statistical Data*
Ni-5A	11.2	2	$n = 5$
	11.1	1	$\bar{X} = 11.1$
	11.0	2	$\sigma = 0.09$
Ni-5B	12.1	1	$n = 5$
	12.0	1	$\bar{X} = 11.9$
	11.9	1	$\sigma = 0.14$
	11.8	1	
	11.7	1	
Ni-6A	27.6	1	$n = 5$
	27.2	2	$\bar{X} = 27.2$
	27.1	1	$\sigma = 0.23$
	26.9	1	
Ni-6B	29.9	1	$n = 5$
	29.4	1	$\bar{X} = 29.0$
	29.0	1	$\sigma = 0.58$
	28.7	1	
	28.2	1	
Ni-1A	55.1	1	$n = 5$
	54.9	1	$\bar{X} = 54.1$
	54.2	1	$\sigma = 0.90$
	53.7	1	
	52.6	1	
Ni-1B	56.1	1	$n = 5$
	53.9	1	$\bar{X} = 54.0$
	53.6	1	$\sigma = 1.08$
	53.2	2	
Ni-7A	85.8	1	$n = 5$
	85.1	1	$\bar{X} = 84.6$
	84.8	1	$\sigma = 1.00$
	84.6	1	
	82.8	1	
Ni-7B	84.2	1	$n = 5$
	83.8	1	$\bar{X} = 83.1$
	83.4	1	$\sigma = 1.03$
	82.6	1	
	81.3	1	
Ni-2A	106.6	1	$n = 5$
	106.0	2	$\bar{X} = 105.7$
	105.7	1	$\sigma = 0.77$
	104.3	1	
Ni-2B	109.3	1	$n = 5$
	109.2	1	$\bar{X} = 109.0$
	109.0	1	$\sigma = 0.87$
	108.8	1	
	108.5	1	
Ni-3A	207	1	$n = 5$
	204	1	$\bar{X} = 203.6$
	203	1	$\sigma = 1.86$
	202	2	
Ni-3B	247	1	$n = 5$
	246	1	$\bar{X} = 243.6$
	244	1	$\sigma = 2.73$
	241	1	
	240	1	
Ni-4A	329	2	$n = 5$
	328	2	$\bar{X} = 327.4$
	323	1	$\sigma = 2.26$
Ni-4B	320	2	$n = 5$
	319	1	$\bar{X} = 317.8$
	318	1	$\sigma = 2.99$
	312	1	
Ni-8A	525	1	$n = 5$
	522	2	$\bar{X} = 520.0$
	517	1	$\sigma = 3.95$
	514	1	
Ni-8C	530	1	$n = 5$
	525	1	$\bar{X} = 523.4$
	524	1	$\sigma = 4.75$
	520	1	
	516	1	

*See footnote for Table I.

thicker coatings), and the consumption of acid was large. It was necessary to use fresh batches of acid periodically during the longer stripping periods, but excellent results were obtained.

During the stripping operation, five specimens were hung on Pyrex-glass racks in a 400-ml beaker which was somewhat more than half filled with acid. Agitation was provided by a slow stream of air introduced through a jet, the outlet of which was near the bottom and center of the beaker.

When the nickel had been dissolved from the steel, the specimen was transferred quickly to a chromic acid solution (10 per cent) for a short dip before it was rinsed in water and finally in alcohol. When the alcohol had evaporated, the specimens were stored in a dessicator. Weighing before and after stripping was done to one-tenth of a milligram, and thicknesses were calculated on the basis of a specific gravity of 8.9 for nickel.

Tests for attack on the steel were carried out in two ways. Pieces of plain steel taken from the same stock as the basis metal for the specimens and of the same size as the specimens were weighed and hung in the acid along with the specimens being stripped. They were carried through the procedure in the same fashion as the specimens and showed no significant weight loss. One of the exhausted stripping solutions was analyzed colorimetrically for iron, and it was found that not enough iron was present to cause a significant error in the stripping results which were calculated by the weight-loss method.

Calculated Thickness

The plated area of each panel was measured and the thickness calculated from this datum, the gain in weight as a result of plating, and the specific gravity of nickel which was taken as 8.9. No correction was made for the very small amount of nickel which was deposited on the back of the cathode.

Experimental Results and Discussion

A resume of the test data is given in Tables I–IV. The data have been so arranged that the number of identical results for a given panel is indicated in the column labeled "Frequency". In addition to the actual measurements of thick-

TABLE V. THICKNESS OF NICKEL PLATE ON STEEL AS DETERMINED BY FIVE METHODS

(All Measurements in Hundred-Thousandths Inch)

Panel number	Calculated	Magne-gage	BNF Jet	Micro-scopic	Strip-ping
5A	10.8	12.8	10.9	13.2	11.1
5B	11.4	13.3	12.5	13.2	11.9
6A	26.5	32.0	27.6	28.4	27.2
6B	28.0	32.9	28.8	30.8	29.0
1A	52.7	63.6	52.9	60.2	54.1
1B	52.5	63.1	53.6	56.5	54.0
7A	81.5	87.7	78.5	85.2	84.6
7B	79.2	85.7	82.3	83.8	83.1
2A	103.3	112.7	103.6	110.3	105.7
2B	108.3	119.1	106.2	113.5	109.0
3A	202	194*	217	211	204
3B	...	...	280	244	244
4A	318	...	340	333	327
4B	315	...	342	323	318
8A	516	...	513	536	520
8C	520	...	617	539	523

*Taken from steep portion of calibration curve.

ness and their frequencies, the total number of measurements, n, the arithmetical average, $\bar{X}$, and the standard deviation, σ, for each panel are given. The nomenclature and the methods of calculation are those set forth in the A. S. T. M. Manual on Presentation of Data[5]. In the case of the calculated thickness based on the gain in weight of the cathode, it is obvious that no average or standard deviation can be calculated in as much as there was but a single measurement. The results for this method have been included in Table V.

All of the results have been summarized in Tables V–VII. Table V gives the average results obtained with the five different methods. It will be seen that the data are quite concordant, except that the Magne-gage results are somewhat higher than the others. Table VI shows the percentage deviation of all other methods from the stripping tests, which are taken as being the most accurate. Table VII compares the standard deviations for four of the methods (the average thickness for each panel as determined by the stripping method is given in the last column for convenience in comparing the various panels).

It would be desirable to show at least some of the information in Tables V–VII in graphical form; in particular, it was planned to plot standard deviations against thickness and percentage deviation from stripping results against thickness. It was found, however, that the variations of standard deviation or percentage deviation from stripping results from one of the duplicate panels to the other were so great that no logical plots could be made. This difficulty is illustrated in Fig. 2 where the percentage deviations of the microscopic results for the duplicate panels have been plotted against thicknesses determined by the stripping method. Any lines which could be drawn through the two sets of points would be highly fictitious, as would a single line purporting to be a weighted mean. It is also easier to study the data in tabular form as given in Table VII than to interpret figures such as Fig. 2.

There is, however, one graphical presentation of the results which is of considerable interest. In Figs. 3 and 4 the average thickness as determined by each of four methods has been plotted against the stripping results. Two figures are required to give suitable scales for both the thin and thick deposits. The dashed lines have a slope of 1; hence the distance of any plotted point from them indicates the deviation of the results represented by that point from the stripping measurements. Figs. 3 and 4 indicate rather strikingly the excellent agreement amongst all of the methods. It is pertinent to mention here that one Magne-gage scale (B) was used for thickness up to and including 0.54 mil (14 μ), and another (E) for thicker deposits. All of the measurements on the B scale are rather uniformly high, and a more suitable calibration would make the results much more satisfactory (see also Table VI).

Table VI reveals that there is, in general, little to choose between the Magne-gage, the jet test and the microscopic method if certain limitations are recognized. The Magne-gage must be suitably calibrated for the metal being measured. The jet test is not satisfactory for thicknesses of 2 mils (50 μ) or more. The microscopic method is unreliable for deposits of 0.5 mil (13 μ) or less. It is interesting to note that the microscopic method, which has so often been considered to be suitable for a reference standard, is no better than the others for thicknesses under 2 mils (50 μ).

The excellent correlation between the calculated thickness and the stripping results as shown in Table VI is extremely interesting. It is evident that at least for nickel-on-steel it is possible to prepare reliable standards for calibration purposes by the simple technique described above. It is well known that the Magne-gage and the jet test are sensitive to structural and other characteristics of the deposit and should be calibrated against standards which have been prepared in the solution and under the conditions which are used in plating the work which is to be measured. In this connec-

TABLE VI. PERCENT DEVIATION FROM STRIPPING RESULTS*

Panel Number	Calculated from Weight Gain	Magne-gage	BNF Jet	Micro-scopic
5A	−2.7	+15.5	−1.8	+18.9
5B	−4.2	+11.8	+5.0	+10.9
6A	−2.6	+17.6	+1.5	+4.4
6B	−3.4	+13.4	−0.7	+6.2
1A	−2.6	+17.5	−2.2	+11.3
1B	−2.8	+16.8	−0.7	+4.6
7A	−3.7	+3.7	−7.2	+0.7
7B	−4.7	+3.1	−1.9	+0.8
2A	−2.3	+6.4	−2.0	+4.4
2B	−0.6	+9.3	−2.6	+4.1
3A	−1.0	−4.8	+6.4	+3.4
3B	.....	.....	+14.8	0.0
4A	−2.8	.....	+4.0	+1.8
4B	−0.9	.....	+7.5	+1.6
8A	−0.8	.....	−1.3	+3.1
8C	−0.6	.....	+18.0	+3.1

*Plus signs indicate that a higher result was obtained compared to the stripping measurement; minus signs indicate the reverse situation.

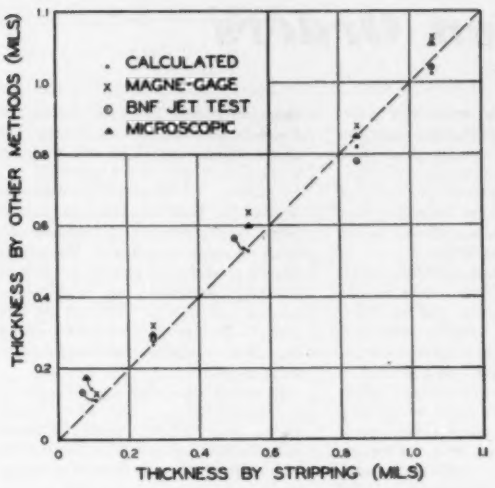

Fig. 3. A comparison of thickness measurements by four methods with results from the stripping method. The dashed line represents perfect correlation. The points at the tails of the arrows are coincident with those indicated by the heads of the arrows

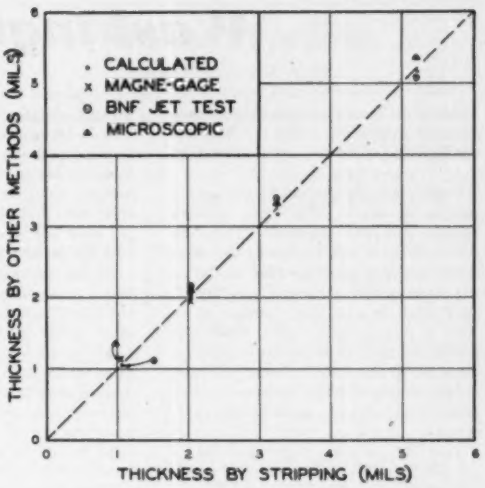

Fig. 4. Same as Fig 3 except for greater thicknesses. The arrows have the same meaning as in Fig. 3.

tion it should be noted that panel 8C was prepared from the same bath as all other panels except that a wetting agent (Duponol ME) was used to stop the pitting which appeared on panel 8B. It will be noted from Table VI that the results of the jet test for panel 8C are out of line with respect to absolute values for the other panels, but Table VII shows that the standard deviation of the measurements on panel 8C was less than for panel 8A. It is evident, therefore, that a new calibration is needed as a result of what would seem to be a minor change in plating conditions.

The self-consistency, or reproducibility, for each method for a given thickness of deposit is indicated in Table VII. If it is assumed that a standard deviation of 5 per cent or less of the thickness represents an acceptable degree of reproducibility, all methods are acceptable except the microscopic which fails to meet this criterion only for the thinnest deposits. In the range of greatest interest, namely, 0.5 to 2 mils (13 to 50 μ), the standard deviation is 3 per cent or less of the total thickness. From the standpoint of reproducibility alone, there is little to choose between the various methods, although the stripping test is consistently somewhat better than all others. The latter fact substantiates the use of this method as a reference standard.

The actual selection of a method for a given measuring problem will have to be based on several factors which will be discussed in a succeeding paper.

TABLE VII. STANDARD DEVIATIONS
(Hundred-Thousandths of an Inch)

Panel Number	Magne-gage (n = 41)*	BNF Jet (n = 20)*	Micro-scopic (n = 20)*	Stripping (n = 5)*	Thick-ness by Stripping
5A	0.57	0.54	1.04	0.09	11.1
5B	0.58	0.55	0.74	0.14	11.9
6A	0.85	0.81	1.20	0.23	27.2
6B	0.89	1.11	1.32	0.58	28.9
1A	1.14	2.06	2.54	0.90	54.1
1B	1.21	1.24	1.56	1.08	54.1
7A	1.54	2.32	1.44	1.00	84.5
7B	1.51	1.14	2.29	1.03	83.0
2A	1.62	1.97	1.15	0.77	105.6
2B	2.91	2.24	1.32	0.87	108.9
3A	3.04	3.96	3.11	1.86	204
3B	....	5.86	3.16	2.73	244
4A	....	7.52	6.20	2.26	326
4B	....	2.57	4.60	2.99	315
8A	....	17.93	11.08	3.95	520
8C	....	12.28	5.94	4.75	523

*n = total number of measurements.

Conclusions

Acceptable thickness standards for nickel-on-steel can be produced easily in a simple cathode box.

The reproducibility of the Magne-gage, the BNF jet test, the microscopic method, and the stripping method is acceptable for most purposes, except when the microscopic method at 500X is used for deposits of less than about 0.3 mil (7.5 μ).

The absolute values obtained with the several methods are acceptable if the proper calibrations are used, except in the case of the microscopic method at 500X which should not be used for deposits of less than 0.5 mil (12.5 μ).

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[3]R. A. Fisher, "Design of Experiments", 5th Ed., Hafner Publishing Company, New York, pp. 49-50.

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[5]A. S. T. M. Manual on Presentation of Data, American Society for Testing Materials, 1943 reprint, Philadelphia, Pa.

Washington Orders

Copies of NPA orders may be obtained from National Production Authority, Washington 25, D. C., or from any of its local offices.

Preliminary requirement figures are beginning to reach NPA from military agencies and other claimants. These are to be used as a basis for the development of a Controlled Materials Plan similar to the one in operation during World War II. Staff work is now being carried on in NPA to develop such a plan, which will permit industry to know the amount of materials available for different purposes. A spot survey of major metal-consuming plants is underway to assist in this development.

Tin. The use of tin is now regulated by not less than five NPA orders, of which four affect the plating industry.

The main order, M-8, was amended on January 27 to include a List A of prohibited uses and Schedules of permitted uses of tin. The former includes advertising specialties, art objects, buckles and buttons, emblems and insignia, certain fasteners, jewelry, novelty souvenirs and trophies, ornaments and ornamental fittings, holloware, refrigerator shelves and trays, toys and games, and all plating for decorative purposes. Tin is expressly permitted for plating dairy equipment; cutlery and hardware; tubing and fittings for refrigeration or in contact with drinking water or beverages; snap fasteners, hooks and eyes (including "chemical plating"); steel bearing shells with up to 0.00006-inch tin; electrotype shells in installations operating on or before January 27, 1951. Lead-base alloys containing up to 4 per cent secondary tin may be used to line chromium plating tanks or to make anodes for chromium plating. A general exception is made for war implements, i. e., combat end products may be plated.

Order M-24, issued on January 27, controls tin plate and terne plate and specifies the maximum thickness of coating permitted for a variety of uses. The use of tin plate in canning is governed by regulations in M-25 and its use in closures in M-26, both dated January 27.

Copper. Order M-12, as amended on December 30, 1950, contains the provisions set forth in our February issue.

Order M-16 dealing with copper and copper-alloy scrap was amended on January 31 to permit a "miscellaneous producer" to melt or process any scrap copper or copper-base alloy generated in his plant through fabrication or accumulated in his operations through obsolescence. He may also accept delivery of scrap. A miscellaneous producer is any person (other than a scrap dealer, refiner, brass mill, brass and bronze foundry, or ingot maker) who requires copper raw materials in his regular production operation, such as operators of chemical plants, iron foundries, aluminum foundries, etc. Converting, remelting or other processing of scrap into electrolytic or fire-refined copper on a toll basis is not allowed except with the permission of NPA.

Nickel. An amendment to Order M-14, issued on January 23, drastically reduces the uses of nickel plating. The use of primary nickel in the form of electrolytic nickel ingots, pigs, rolled and cast anodes, shot, oxides, salts, chemicals and residues derived directly from new nickel including residues containing nickel derived as a by-product from copper-refinery operations, secondary nickel, or nickel-bearing scrap containing 6 per cent or more nickel is forbidden for the plating of a long list of radio and television parts; hardware; household appliances, jewelry and clocks; metal furniture and fixtures; motor-vehicle parts; novelties; plumbing; sheet, strip and wire products; tools; toys; utensils; and miscellaneous items.

A few exceptions are listed, namely, under builders' finishing hardware, the half trim for bathroom and toilet side of door, and valve handles for bathroom and kitchen fixtures; under household appliances, parts subject to abrasion and heat, strike coatings prior to silver plating or vitreous enameling, shelving and door handles for refrigerators, and vacuum-cleaner runners; under motor-vehicles, window frames and slide channels, door handles, bumpers, bumper guards, and bumper bolts, exposed screws where no satisfactory substitutes are available (the nickel on bumpers and bumper guards shall not exceed the amount equivalent to a 0.001-inch coating on outside surfaces); under tools, measuring tape, and functional parts on power tools; under toys, handle bars, sprockets, spokes and hubs on bicycles; under utensils, strike coatings prior to silver plating or vitreous enamelling; under miscellaneous, tonsorial tools. For those permitted uses, only a quarterly use of 65 per cent of the quarterly use during the first half of 1950 is permitted, except that a user of 250 pounds per calendar quarter may use up to that amount.

The use of nickel-bearing stainless steel, high-nickel alloys and nickel silver is similarly restricted.

Zinc. Order M-15 was amended on January 15, but only to the extent of adding some definitions.

Chromate chemicals. Producers of these chemicals, at a meeting with NPA officials of January 16, indicated that there would be no supply problem if the Government makes certain that sufficient ore from South Africa reach this country. Large reserves of low-grade ore can be mined in Montana in case of need, but its use would result in lowered efficiency in the manufacture of the chemicals.

Chlorine. A shortage of elemental chlorine has been developing for several years, largely because of increased demand for organic synthesis. Marketable chlorine production (about 60 per cent of production is captive, i. e., produced by users) is estimated at 6,000 tons per day against a demand of 7,200–8,000 tons per day. Some expansion of production facilities is under way.

In view of this situation, NPA issued on January 23 an order M-31 which, among other things, requires producers and distributors to continue filling orders from their 1950 purchases of chlorine, whether public or private, who are engaged directly in purifying water for human consumption and use or for treatment of sewage where the use of chlorine is essential to public health. Every order for public-health chlorine shall contain the certification: Certified under NPA Order M-31. NPA offers assistance to those users who cannot get public-health chlorine under the provisions of the order.

Penalties for violation. Paragraph 11.26 in Regulation 2 states: "Any person who willfully violates any provision of this part or any other regulation or order of the NPA, or furnishes false information or conceals any material fact in the course of operation under any such regulation or order, is guilty of a crime and upon conviction may be punished by fine or imprisonment or both."

According to Raymond M. Shock, attorney and Executive Secretary of the National Association of Metal Finishers, Inc., all such regulations are issued under the authority granted to the President in the Defense Production Act of 1950. That Act is divided into seven different titles. Title 1, Priorities and Allocations, under which NPA Regulation No. 2 was issued, specifically provides that any person who wilfully performs any act prohibited or wilfully fails to perform any act required by the provisions of this title or any rule, regulation, or order thereunder, shall upon conviction, be fined not more than $10,000 or imprisoned for not more than one year or both.

The aforesaid paragraph 11.26 continues: "In addition, administrative action may be taken against any such person to suspend his privilege of making or receiving further deliveries of materials or using facilities under priorities or allocation control and to deprive him of further priorities assistance".

A similar violations paragraph appears in all NPA regulations and orders, and the same penalties apply.

CYANIDE WASTE

(*Continued from page 242*)

in great turbulence which helps the solution process. The stream after passing through the injector is returned to the rinse tank through a diffuser located in the sump. This sump also contains the electrodes of the *p*H meter which has both an alarm and a visual indicator. The operation is continuous, the water in the tank being constantly recirculated while the machine is in use. Fresh water is added to the rinse tank at a rate of about 1 gpm (4 l/min) so that a like amount overflows to the sewer. The chlorine feed can be adjusted from 0 to 100 lb/day (0–45 kg/day), the capacity of the machine. With present operation this adjustment is made to about 80 lb/day (36 kg/day), and the alkalinity is adjusted by adding caustic soda to maintain a *p*H of 8.5–10. From 2 to 4 pounds (0.9–1.8 kg) of caustic soda per hour is so used. The figure of 80 lb/day (36 kg/day) was determined by finding the average needed to maintain free chlorine in the sump. We deem the presence of free chlorine in the sump to be a suitable indication of the absence of cyanide; for our purpose the chlorination need not go beyond the formation of cyanates. A check for free chlorine can be made at the machine, as follows:

1. Use about 100 ml of sample
2. Add one or two drops of methyl orange indicator solution
3. Stir. Disappearance of color indicates presence of free chlorine
4. The *p*H indicated by the *p*H-meter in the sump must be in the range 8.5–10

Before the equipment was put into operation, it was thought that the chlorination would have to proceed for perhaps 4 hours before the rinse water should be discarded to the sewer and a new chlorination cycle begun. Experience in actual operation caused us to decide to allow an overflow of 1 gpm (4 l/min) by the addition of fresh water, thus theoretically displacing the solution every 2 hours. This arrangement makes it unnecessary to discard the rinse water in bulk and results in less down time for the plating operation.

The cost of the above-described equipment was approximately $3,000, and the chemical cost is about 60 cents per hour.

Conclusion

In conclusion we would like to leave the thoughts that:

1. It is both possible and practical to destroy cyanide in rinse waters of a plating machine.
2. Much can be accomplished without a disposal plant.

We realize that our system is not yet perfect and has weak points which we intend to correct. Obviously, as we approach the ideal of uncontaminated process waters, each step becomes more difficult and offers diminishing returns.

Book Review

DR. HAROLD J. READ
Associate Professor of Metallurgy, Pennsylvania State College

A Measure for Greatness by David O. Woodbury, ix + 230 pages, 1949. McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 18, N. Y. Price, $4.00.

Electroplaters should find more than casual interest in the biography of a man who played a prominent part in the development, among other things, of early and successful nickel-plating processes, the low-voltage direct-current generator, practical and accurate ammeters for the measurement of large currents, and our presently accepted reference cell for voltage measurements. Mr. Woodbury has examined with great care the busy and fruitful life of Edward Weston, and has written a biography that abounds in technical interest presented against the background of Weston's forceful personality and inspiring career.

Weston lived and worked during the latter part of the 19th and early part of the 20th centuries when striking technological advances were more commonly the result of individual inventiveness and exploitation than at present. In the era of Edison, Thomson, Brush, Maxim and other outstanding and prolific inventors, Weston was not only able to keep in the vanguard of successful technical men, but he also managed to amass a fortune in spite of rival promoters and piratical business men. It was a period of ruthless competition, and the shrinking violet was trod upon without mercy—Weston, apparently, was a cactus.

It is refreshing to find an author who can recount the life of a scientist with both technical accuracy and interesting narrative. The author has correctly assumed that his readers would be interested primarily in Weston's scientific accomplishments, and he has used these as the threads of a warp into which he has woven the weft of his subject's personal life. Weston's character, his vicissitudes and his accomplishments emerge as the pattern of his technological work is developed. It should be noted, however, that the author has slipped occasionally on the technical side of his story, e. g., the chemical behavior ascribed to permanganate on page 34 is at least confusing, ores are not concentrated by roasting as stated on page 71, and the patent "claim" quoted on page 90 is part of a patent specification. These and a few others of the same kind are errors which do not give rise to sufficient indignation to spoil one's interest in the book.

The account of Weston's preparation for and participation in technical litigation is particularly enthralling. He spared no effort and neglected no detail in his preparation of a case, and became one of the most successful trial experts of his day.

This book can be heartily recommended. The prospective reader is warned only against using it as a soporific.

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Style C-20. For contour and straight polishing operations—used in conjunction with Back-Stand Idlers and Coated Abrasive belts.

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F-26. Prevents belt loading and glazing. Greatly increases abrasive belt life. Produces finer and smoother finishes.

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QUESTION BOX

readers' questions of general interest

Q. 110. What type tank lining is best for a 20 per cent nitric, 2 per cent hydrofluoric acid mixture heated to 150° F and used to pickle 300 series stainless steel and some aluminum alloys?

A. Satisfactory service has been had by lining the steel tank with a vinylidene chloride copolymer and then sheathing it with carbon brick jointed with a special hot-poured sulfur-base cement. A firm supplying these materials is Atlas Mineral Products Company, Mertztown, Pa., and Houston, Texas.

It is also suggested that you investigate the use of high-temperature Lucite. The Singleton Company, 9823 Lorain Avenue, Cleveland 2, Ohio, in its Bulletin SW-IX on welded products of this material, states that years of continuous service is had with a solution of 3 parts nitric, 1 part hydrofluoric acid, and 2 parts water at 220° F.—M. B. DIGGIN.

A. We have supplied a number of Koroseal-lined tanks for this purpose, and they have been extremely satisfactory. You will undoubtedly want to use a heater of impervious graphite in the tank.—R. B. SALTONSTALL.

A. We would recommend a vinyl-type of calendered sheet lining such as Koroseal. If the mechanical service is rather severe, we would further recommend a carbon-brick sheathing on top of the Koroseal to take the wear.—C. E. HEIL.

Q. 111. How can I remove cadmium which has plated on the side of my tank? I understand that it is dangerous to burn it off.

A. A number of deaths have resulted when men have tried to melt cadmium off a tank with a blow torch. We would warn against all attempts to melt cadmium or cadmium scrap without very excellent and reliable ventilation that expels any fumes high above any buildings in the neighborhood.

Probably the best way to remove it is to pull all anodes out of the tank, make the tank anodic, and keep plating until the cadmium has dissolved. For highest rate of removal the current used should not be above 20–25 amperes per square foot of cadmium surface.

Cadmium dissolves so slowly in acid that the steel would dissolve as fast or faster. However, it may be possible to accelerate the attack on the cadmium by laying the tank on the side where the cadmium is, placing some copper bars on top of the cadmium, and then covering that side with a 10 per cent (by vol.) sulfuric acid.—K. G. SODERBERG.

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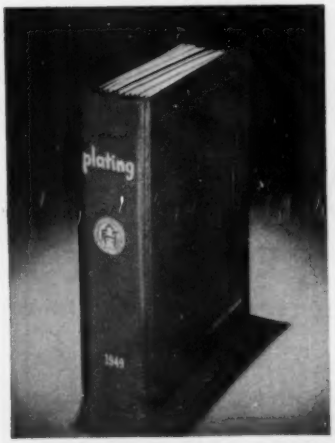

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Article Abstracts

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The Anode Layer in the Electrolytic Polishing of Copper. H. F. Walton. J. Electrochem. Soc. **97,** 219–226 (July, 1950).
Viscosities and electrical conductivities of solutions of $CuHPO_4$ in aqueous phosphoric acid and phosphoric acid-glycerol-ethylene glycol mixtures were measured as an aid in investigating the anode layer formed when copper is electropolished in these solutions. Copper concentrations near the anode during electrolysis were measured, and current-voltage relationships were studied using a rotating copper anode. Effective thickness of the anode layer was estimated to be about 10^{-4}cm. 18 ref.

How Aircraft Engine Parts Are Barrel Finished. Dudley J. Kaharl. Iron Age **166,** 81–83 (July 13, 1950).
Describes methods applied to aluminum and steel parts by Pratt & Whitney Aircraft Div., United Aircraft Corporation, East Hartford, Conn.

Metal Powder Parts Successfully Plated by New Process. Jerome F. Kuzmick, Materials & Methods **31,** 54–56 (June, 1950).
Describes use of heat treatment to remove residual plating salts as a means of eliminating "spotting-out" in electroplating porous-metal compacts. Process, known as Etolizing, has been applied successfully to coating of porous iron, brass, and bronze with copper, nickel, silver, copper, nickel alloys, and bronze, also chromium under certain conditions.

From a Metallurgist's Notebook; Chromating. H. H. Symonds. Metal Ind. (London) **76,** 490 (June 23, 1950).
Experiments carried out to ascertain the cause of inconsistent response to chromating of zinc-castings are described and illustrated.

Effect of Inhibitors on the Acid Pickling of Steel, Part I. M. Smialowski and J. Foryst, Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa **1,** No. 2, 147–153 (1949).
Experiments were made to determine the inhibition efficiency of dibenzylsulfide, dibenzylsulfoxide, and thiocarbanilide in the acid pickling of iron, steel, and other metals. Results show that the action of inhibitors is more chemisorption than pure physical sorption, and that this phenomenon is related to the ability of some metals, particularly nickel, cobalt and iron, to become passive. 11 ref.

Surface Treatment and Finishing of Light Metals; Part 5. S. Wernick and R. Pinner. Sheet Metal Inds. **27,** 553–557 (June, 1950).

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Describes chemical oxidation treatment for tubes; phosphate processes, and bonderizing. Compares chemical oxide conversion coatings. 109 ref.

Anodic Process During Electropolishing of Copper in a Solution of Orthophosphoric Acid. K. P. Batashev and E. N. Nikitin. Zhurnal Prikladnoi Khimii **23,** 263–270 (March, 1950).

Analysis of the products of anodic solution indicated that the secondary copper phosphate is formed in the initial stage of electropolishing and the tertiary in the final stage. Mechanism of electropolishing is explained in accordance with the shape of the potential curves obtained. Thermodynamically calculated static potentials of copper in solutions of its phosphates are confirmed experimentally. Data are tabulated. 10 ref.

Thin Layers of Titanium as Produced by Electrodeposition. M. Haissinsky and H. Emmanuel-Zavizziano. Compt. rend. **204,** 759–761 (1937); Translation No. 337, Henry Brutcher, Altadena, Calif.
Describes electrolysis of Na_2SO_4-containing $Ti(SO_4)_2$ with lead cathode and platinum anode.

The Fatigue of Metals. C. C. Thurston. Can. Metals **13,** 8–11, 48–49 (June, 1950).
Discusses some of the factors which affect fatigue resistance of metal parts in service. Headings are: the nature of fatigue; the S/N curve and its derivation; stress-reisers, general; machining and polishing; geometry of surface; shot-peening; cold-rolling; presetting or scragging; cyaniding, carburizing, and nitriding; metallic surface coatings. 12 ref.

Effects of Anodic Coatings on the Fatigue Strength of Aluminum Alloys. G. W. Stickley and F. M. Howell. Am. Soc. Testing Materials, Preprint 32, 1950, 8 pages.
Describes fatigue tests on 17S, 25S, 75S, and B355. Results are tabulated, plotted and discussed. Includes micrographs.

Surface Layers on Magnesium. F. Sauerwald. Z. anorg. Chem. **262,** 69–78 (May, 1950).

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Magnesium alloys were anodized in salt baths and in aqueous solutions of the same salts in order to study the corrosion properties of the resulting surface films. Data are graphed and tabulated.

Electrolytic Dissolution of Copper in Ammoniacal Electrolytes. Fred A. Schimmel. J. Phys. & Colloid Chem. **54**, 841–847 (June, 1950).

It is known that copper can be dissolved electrolytically in ammoniacal electrolytes. A process based on this fact has been used recently with success for the recovery of copper from copper plated iron scrap. Conditions were determined under which copper can be dissolved anodically in the cuprous form and also deposited cathodically from the monovalent state using an ammoniacal electrolyte.

Recommended Practice for the Repair and Reclamation of Non-Ferrous Castings. Inst. Brit. Foundrymen, Paper No. 970, 1950, 12 pp. (Advance Copy).

Describes repair and reclamation by burning, welding, brazing, soldering, annealing, impregnation, calking, plating, and metal spraying. Copper and aluminum base alloys are given as examples. 48 ref.

A Rapid Method of Immersion Silvering; Pre-Treatment, with Stannous Chloride. Chem. Age, **63**, 14, 17 (July 1, 1950).

Pretreatment with stannous chloride resulted in great improvement of the silvering process using a 1 per cent ammoniacal solution with 10–15 per cent pyridine and addition of hydrazine sulfate to reduce the silver salt. In contrast to the usual process, little silver was precipitated on the walls of the vessel. A surface-active agent was required when very pure pyridine was used, hence it was discovered that other bases—ammonia or cyclohexylamine—could be used in the presence of the surface-active agent. The process also proved useful as a tool to investigate the catalytic effect of silver, platinum, and various other metals on the chemical reduction of metals from aqueous solution.

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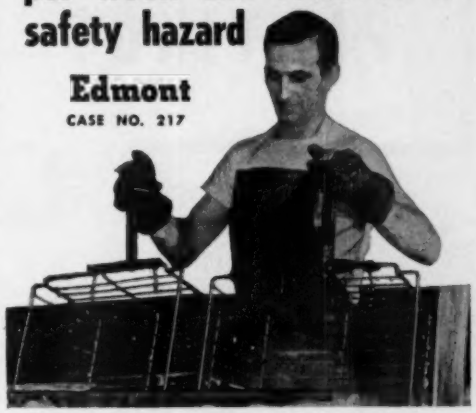

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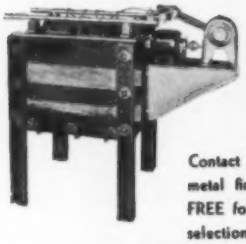

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Patent Abstracts

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Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,532,629, December 5, 1950—Method of Electrodepositing Iron—E. H. Konrad and W. E. C. Eustis, assignors to Sulphide Ore Process Company, Inc., New York, N. Y.

CLAIM 1. A method for electrodeposition of iron, comprising as steps the passing of an electric current through an aqueous electrolyte containing ferrous chloride, between a cathode surface and a graphite anode bar in spaced, opposed position to each other in the aqueous solution and separated by a diaphragm which is pervious to said aqueous solution, the anode bar on its surface opposed to the cathode surface being in contact with a layer of granules of graphite having individual cross-sectional dimensions upward from one-eighth inch, and the granules being in electric contact with each other and presenting a surface area to the aqueous solution of ferrous chloride which is greater than the area of the graphite anode bar, and electrodepositing iron on the cathode.

2 claims, 5 figures.

References cited: U. S. Patents 155,884; 830,918; 1,239,443; 2,273,036; 2,464,889.

No. 2,532,907, December 5, 1950—Method and Apparatus for Electrolytically Treating Metal Surfaces—C. W. Hangosky.

CLAIM 1. In an apparatus for electrolytically treating a surface of metal, a support having an aperture therein defining the portion of the surface of the object to be treated, means for directing a solid column of electrolyte through the aperture against the surface of the object, said means including a conduit having a discharge orifice somewhat wider than the said aperture-defining surface and also including an electrolyte-

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2—1500 A. Century
1—2500 A. Gen. Elec.
2—3000 A. Electric Products
1— 600 A., 24 V. Reliance
1— 200 A., 25 V. Star
1— 300 A., 25 V. Star
1— 175 A., 25 V. Cr. Wh.

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2— 100 A., 30 V. Gen. Elec.
1— 200 A., 30 V. West.
2— 500 A., 32 V. Gen. Elec.
2—1500 A., 32/40 V. Century
1—1000 A., 33 V. Gen. Elec.
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2— 200 A., 42 V. Gen. Elec.
3—1500 A., 45 V. Century
1—1500 A., 50 V. Gen. Elec.
2— 800 A., 50 V. Gen. Elec.
1— 400 A., 50 V. Gen. Elec.
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Patent Abstracts

discharge zone for removing an external portion of the said stream prior to its contacting the said surface, a cathode in contact with the electrolyte, means for establishing an electric circuit including the cathode, the object and the electrolyte, and means including grooves formed in a surface of the support extending radially from said aperture for conducting electrolyte from the surface being treated, said conduit being substantially vertically positioned in alignment with the aperture over which said object is supported.

26 claims, 13 figures.

References cited: U. S. Patents 820,482; 844,262; 1,219,843; 1,416,929; 1,940,612; 2,199,501; 2,382,735. British Patent 335,003. Swedish Patent 39,808. Metal Progress 209–212 (August, 1942). Kent *et al.*, "Hydraulics", 5 ed (1948), John Wiley & Sons, pp. 176–178.

No. 2,533,096, December 5, 1950—Production of Iron Powder—H. H. Cudd and Emma J. Freeman, assignors to International Minerals & Chemicals Corporation.

CLAIM 6. The method of producing iron powder which comprises: preparing an aqueous electrolyte which contains from about 2.8 to about 19.7 per cent ferrous ion and from about 0.1 to about 0.6 per cent of Chili-soap-bark saponin, adjusting the acidity of the solution to a *p*H of between about 1.0 and about 3.0; electrolyzing the electrolyte to deposit iron as a dendritic powder by employing a current density of from about 25 to about 140 amperes per square foot; and separating the iron powder from the electrolyte, the size range of the iron particles being determined by the percentage of saponin in the solution, the particle size decreasing with an increased concentration of saponin.

8 claims.

References cited: U. S. Patents 949,004; 1,912,430; 1,931,854; 2,157,699; 2,233,103; 2,287,082; 2,389,180; 2,420,403; 2,464,168; 2,464,889; 2,480,156. British Patent 329,324. Trans. Electrochem. Soc. 25, 529–532 (1914). Metal Ind. (London) 350 (October 7, 1938).

No. 2,533,532, December 12, 1950—Electrodeposition of Nickel—W. B. Stoddard, Jr., assignor to The Champion Paper and Fibre Company.

I have now discovered that by properly selecting and controlling the composition of the electrolytic bath and the condition of electrodeposition, it is possible to deposit nickel of substantially uniform physical properties and to secure deposits of any predetermined desired degree of strength, hardness and ductility, within rather wide limits. . . .

In order to secure deposits of such predetermined physical properties I use a modification of the well known Watts bath containing the formate radical in addition to the usual nickel sulfate, nickel chloride and boric acid. . . .

For this purpose a plating bath of the following composition was used:

EXAMPLE I

$NiSO_4.7H_2O$, g	158.94
$NiCl_2.6H_2O$, g	53.64
$Ni(COOH)_2.2H_2O$, g	31.65
H_3BO_3, g	25.61
Water, liter	1
*p*H	2.75

CLAIM 1. In the electrodeposition of nickel from a bath of the Watts type wherein the nickel sulfate and nickel chloride are present in a ratio of between 2:1 and 8:1, which is substantially free from formaldehyde and from sodium, potassium and ammonium ions, the method of setting up the operation to yield deposits of a predetermined specified hardness between 100 and 400 Vickers which comprises including the formate radical in the bath and so establishing the proportion thereof and other conditions of deposition in accordance with the degree of Vickers hardness V specified for the deposit that

$$V = [500\,A + 800\,(F - 0.128)]\ \sqrt[3]{pH/CD}$$

and within the limits about as follows: the ratio F of formate to the total nickel between 0.1 and 0.5, the *p*H between 2.0 and 3.5, the current density CD between 120 and 30 amperes per square foot, and the agitating factor A between 1.0 corresponding to moderate agitation and 2.0 corresponding to turbulent agitation, and bringing the bath to a temperature of between 110 and 160 deg Fahrenheit.

3 claims, 5 examples.

References cited: U. S. Patent 2,026,718. British Patents 526,966; 526,967. "Modern Electroplating" (1942), pp. 250, 253. Metal Ind. (London) 155 (February 9, 1940).

No. 2,533,533, December 12, 1950—Method of Forming a Strongly Adherent Electrodeposit—W. B. Sloddard, Jr., assignor to The Champion Paper and Fibre Co.

Since it is generally desired to electrodeposit metal over both solder and nickel surfaces, the film formed over the solder must be electrically conducting when submerged in the plating bath, to the extent that it does not materially interfere with the electrodeposition of metal over surfaces covered thereby. . . .

I have further discovered that such a film can be formed on and confined to the surface of the solder by use of electrochemical reactions which involve metals present only in solder. The particular reaction which I have found most effective in the formation of such films on solder is anodic treatment in a concentrated solution of sulfuric and phosphoric acids. . . . no further treatment of the nickel surface is required to so prepare it for the reception of a deposit of nickel that the bond between the basis metal and the deposit will be substantially as strong as the metal itself.

CLAIM 4. The method of forming a strongly adhe-

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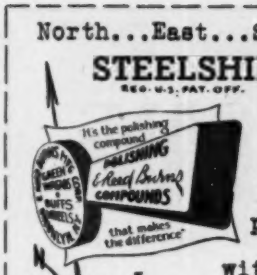

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rent electrodeposit of a metal chosen from the class consisting of iron and nickel onto the surface of a metal chosen from the class consisting of steel and nickel in the presence of solder which comprises: completely covering the surface of the solder by anodic treatment of the composite surface, using a potential between 6 and 9 volts at a temperature between 30 and 45 degrees C in a concentrated aqueous solution of sulfuric and phosphoric acids containing not less than one per cent of phosphoric acid, with a coextensive, electrically conducting film which is resistant to penetration or removal by the plating solution; rinsing the parts with water; and thereafter electrolytically deposit said chosen metal over said metallic surface including the film on the solder.

10 claims, 19 figures, 8 examples.

References cited: U. S. Patents 1,455,028; 1,674,941; 1,793,936; 1,906,376; 2,132,438; 2,299,054; 2,334,699; 2,457,061. Metal Finishing 306–312 (June, 1942). Products Finishing 66, 68 (August, 1945).

No. 2,534,165, December 12, 1950—Agitating Electroplating Mechanism—C. L. Fread, assignor to Gerity-Michigan Corporation.

CLAIM 2. In combination with an apparatus for moving work pieces longitudinally through an elongated electroplating tank comprising an endless chain at each side of said tank, push members extending upwardly from each of said chains and in pairs at opposide sides of said tank, power-carrying bus bars at each side of said tank, work-holding electrode rods spanning said tank from side to side and carried by said bus bars, insulating members on said rods interposed between the rods and said push members, mechanism for moving the chains whereby said rods are moved longitudinally of said tank, and means to support the ends of said electrode rods in constant sliding contact with each of said bus bars, means to impart vertical movement to said bus bars, a plurality of synchronously driven eccentrics, and hydraulic shock absorbers attached to said bus bars so as to partially relieve said eccentrics of the weight of the bars and work during the downward movement of the bars.

2 claims, 10 figures.

References cited: U. S. Patents 896,473; 1,315,029; 1,376,379; 1,773,179; 1,866,124; 2,129,463; 2,222,839. French Patent 748,684. The Meaker Company, Bulletin 313 (1930), pp. 14, 16.

No. 2,538,160, January 16, 1951—Method of Electroforming Molds—C. L. Millon, Jr. and C. A. Nielson, assignors to United States of America, Secretary of Army

CLAIM 1. In the production of seamless cosmetic gloves for covering prosthetic hands, the steps which comprise immersing a model natural hand in a congealable liquid alginate composition which forms a stiff, elastic gel when congealed, congealing the composition around the hand and adjacent arms portions, thereby producing an impression in the congealed

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Photomicrograph of EXOLON RST Polishing Grains.

● EXOLON RST is aluminum oxide fused in an electric arc furnace to form a hard, enduring abrasive. It is crushed, carefully graded, run through powerful magnetic separators, and ceramically coated to increase adhesion to set-up wheels. These chunky grains of RST assure efficiency and economy in all types of metal finishing.

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alginate gel which duplicates all surface characteristics of the model hand, removing the hand from the depression without permanently distorting the impression and lines therein duplicating the surface characteristics of the model hand, producing an open, flexible positive of the model hand from the said impression by filling the impression with a congealable liquid resinous composition including a polymerized vinyl resin dispersed in a plasticizer therefor and which gels at a temperature below the liquefying temperature of the alginate to form a flexible elastic gel congealing the resin on the periphery of the impression, removing residual ungelled resin from the impression while leaving the resulting flexible positive in said impression, filling the resulting open, seamless, flexible positive with a readily removable rigidfying core, removing the resulting rigidfied positive from the said impression, rendering the positive electrically conductive, electrodepositing a mold metal on the rigid positive except over portions of the core exposed by the opening in the positive, thereby producing an open, electrodeposited mold form through the opening in which the core and flexible positive can be removed, and removing the core and flexible positive from the electrodeposited metal through the said opening, thereby leaving a hollow seamless, open metallic mold interiorly duplicating the surface characteristics of the original model hand.

4 claims, 13 figures.

References cited: U. S. Patents 1,296,498; 2,124,871; 2,275,582. Carl Dome Clarke, "Molding and Casting", 2nd ed (1946), pp. 135, 136, 291, 294. S. D. Tylman and F. A. Peyton, "Acrylics" (1946), pp. 141–144.

No. 2,538,990, January 23, 1951—Electrolytic Process for Producing Iron Products—H. V. Trask, assignor to Buel Metals Company, St. Paul, Minn.

CLAIM 3. The process for making an iron powder which comprises maintaining in a cell of solution composed substantially entirely of ferrous chloride and water at a concentration within the range of 20 to 125 grams of iron per liter and at a *p*H of from 3 to 5.5, subjecting said solution to electrolysis between a soluble iron anode and a cathode at a current density of between 10 and 40 amperes per square foot and at a temperature within the range of 15 to 40° C, the values within said ranges being selected to produce a brittle, dull-gray plate having specific gravity from 6.3 to 7.25, pulverizing said plate to particle sizes and shapes suitable for compaction in forming dies, and annealing the resulting powder in a reducing atmosphere and at a low fritting temperature to produce a powder containing less than 0.5 per cent impurities.

3 claims, 9 figures.

References cited: U. S. Patents 1,769,605; 1,912,430; 2,099,873; 2,157,699; 2,223,928; 2,286,237; 2,287,082; 2,359,401; 2,389,734; 2,464,168; 2,464,889. British Patents 549,954; 316,748. Chem. Met. Eng. *26*, 639, 640, 641 (1922).

How to Dispose of Waste Cyanide Solutions

A DISPOSAL METHOD now coming into wide use is that of oxidizing the cyanide ion to the much less toxic cyanate in a strongly alkaline solution.

CYANATES are about $\frac{1}{1000}$ as toxic as *cyanides*. Accordingly, waste containing 100 ppm cyanide becomes practically non-toxic if the cyanide is all oxidized to cyanate.

THE OXIDATION OF CYANIDE to cyanate is not only rapid, but it appears applicable to almost all types of cyanide wastes.

MANY OXIDIZING AGENTS can be used, but chlorine is probably the most satisfactory and cheapest. It may be fed as a gas, an aqueous solution, or as solid hypochlorite.

FORTUNATELY, after a basic solution of cyanide is oxidized to cyanate, the further addition of chlorine decomposes it to carbon dioxide and probably nitrogen or nitrogen compounds.

PUBLIC SEWERS are generally used as outlets for waste from plants that are not located on streams. Usually, higher concentrations are permissible than in streams, although local conditions and legal requirements dictate allowable practice. Actually, even though cyanates are not particularly poisonous, there is a tendency on the part of pollution control authorities to require destruction of the cyanates.

A.E.S. RESEARCH PROGRAM

THE AMERICAN ELECTROPLATERS' SOCIETY is conducting a comprehensive research program and has developed useful information on current plating problems. International Nickel, in addition to its other support of this program, feels that it will be a further service to make copies of A.E.S. Research Reports available to electroplaters.

THE SUBJECT OF CYANIDE WASTE TREATMENT, approached from different viewpoints, is reviewed in A.E.S. RESEARCH REPORT, Serial No. 14, entitled: "Disposal of Plating Room Wastes." We offer you a free copy of this report. Write for it now.

* * *

On January 1, 1951, National Production Authority Order M-14, respecting the consumption of primary nickel, went into effect and subsequent amendments limit the applications for which nickel and its alloys may be used.

Within these limitations, we shall continue to issue information on new developments and user experience with nickel-containing materials, as we believe that dissemination of such data can help to promote the intelligent utilization of critical materials, so essential in these times.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

A. E. S. News

Boston Branch Proposes Increase in Dues and Per Capita Tax

An Amendment proposed to the Constitution and By-Laws of the Society for the purpose of relieving financial difficulties.

NOTE: Under the Constitution an Amendment submitted for four or more Branches or approved by the Executive Board and OK'd by the Law Committee shall be published in the official journal within three months of receipt and voted upon within three months of publication.

A RESOLUTION To Increase the Minimum Dues of Active Members in the American Electroplaters' Society, Inc.

WHEREAS the necessary expenses of the American Electroplaters' Society have increased with the general increase in cost of services and commodities to an extent which the Executive Board, having in our opinion explored to the best of its abilities the resouces of economy and efficiency, finds itself unable to offset without disastrous weakening of the General Fund, and

WHEREAS we regard as undesirable now and suicidal in the long run any curtailment of the established functions and services on which the prestige and usefulness of the Society rest; therefore be it

RESOLVED: that it is the sense of this meeting of Boston Branch that the annual dues of Active Members, now set at eight dollars, should be increased on April 1, 1951, to ten dollars, and that of this amount there should be paid to the Society a Per Capita Tax of seven dollars fifty cents; and be it further

RESOLVED: that Boston Branch invites the prompt approval of the Executive Board and participation of other Branches of like mind in support of the motion to amend incorporated as Appendix I of this Resolution.

Voted by Boston Branch in regular meeting February 1, 1951.

GEORGE P. SWIFT, *Secretary*

APPENDIX I

A Motion to Amend the Constitution and By-Laws of the American Electroplaters' Society, Inc., by increasing the annual dues of Active Members and the Per Capita Tax paid the Society.

MOVED: that the Constitution and By-Laws of the Society be amended as follows:

Constitution, I, V, Sec. 2, *Annual Dues.* In provision (a) strike out "eight" and substitute "ten".

Constitution, I, V, Sec. 3, *Per Capita Tax.* Strike out "four dollars and seventy cents ($4.70)" and substitute "seven dollars and fifty cents ($7.50)".

By-Laws, I, V, Sec. 3, *Per Capita Tax.* Strike out "$4.70" and substitute "seven dollars and fifty cents ($7.50)".

By-Laws, II, VIII, Sec. 1, *Amount.* Strike out "$8.00" and substitute "$10.00".

and be it further

MOVED: that the Executive Board be and hereby is empowered to allocate at its discretion to the Research Fund an amount not exceeding one dollar ($1.00) per annum per member from the proceeds of the Per Capita Tax levied under the terms of this Amendment.

I certify that the above motion has been reviewed by the Law Committee of the Society and is found suitable for immediate publication and vote.

Signed, MANSON GLOVER,
Law Committee, Chairman

The Executive Board has voted to approve this amendment by 4 affirmative votes against 1 negative vote.

Research Committee To Meet

The Research Committee will meet on March 16 in Benjamin Franklin Hotel, Philadelphia, Pa. The Finance Subcommittee and the Research Directing Subcommittee will meet separately at 10:00 A. M. and join for luncheon and joint meeting at 12:30 P. M.

Incompleted Transfers from One Branch to Another

A number of members who during the period June, 1948–December, 1949 did not complete their transfer from one Branch to another and whom the Executive Secretary has been unable to reach by mail, have now been suspended. Their names are listed in the membership report in this issue.

New Sustaining Members

A complete list of sustaining members is published in this issue. It includes several new names, as follows:

Chicago Thrift-Etching Corporation, Chicago, Ill.
Diamond Alkali Company, Painesville, Ohio
Promat Division, Poor & Company, Waukeegan, Ill.
Yale Polishers & Platers, Inc., Chicago, Ill.

Research Committee Appointments

Mr. H. V. Struckhoff, Chairman of the Research Finance Subcommittee, has appointed the following District Supervisors:

Eugene L. Combs, Cleveland, Ohio
Manson Glover, Malden, Mass.
R. F. Ledford, Chicago, Ill.

Baltimore-Washington Branch Presents Pot to President Neill

The Baltimore-Washington Branch made President William J. Neill eligible for membership in the Order of the Pot by presenting him with a pot at the close of its meeting on January 9, in Baltimore.

Left to right: A. E. S. Past President and Honorary Member Thomas F. Slattery, A. E. S. Past Presidents Fred Fulforth and Kenneth Huston, President Neill, A. E. S. Honorary Member, Dr. William Blum

The presentation was made by Past President Kenneth M. Huston, a charter member of the Order of the Pot and its first Potscriber.

In his remarks prior to the presentation, Huston explained that the Order of the Pot was organized by Past President Pinner after the Law Committee which had consisted of Past Presidents was reorganized under the new constitution.

The objects of the Order are:

1. To bind the Past Presidents of the Society into a group for the furtherance of the aims of the Society,

2. To promote good fellowship among those that have given the time necessary to operate the functions of the Society, and

3. To provide a group of experienced leaders to whom the Executive Board of the Society may refer for counsel problems of organization, policy or finance.

Membership is limited to those Past Presidents who have acquired a pot during their term of office as president.

Pots are acquired by (a) presentation by a Branch before whom he appears during his term of office, (b) talking his own Branch into presenting one to him, or (c) stinkers preparing their own.

President Neill's pot is a hand-formed brass bowl, silver plated over copper, with a two-inch copper stripe encircling the outside of the bowl on which the president's name is engraved. The inside of the bowl is gold plated and highly polished. A gold plated handle is riveted to the bowl with no-leakage rivets.

Annual dues in excess of a nominal operating fund are to be used to promote the welfare of the Society by encouraging articles for the Society's monthly publication, stimulating membership drives, or promoting the Research Program.

The official slogan of the Order is: "At Least We Have a Pot".

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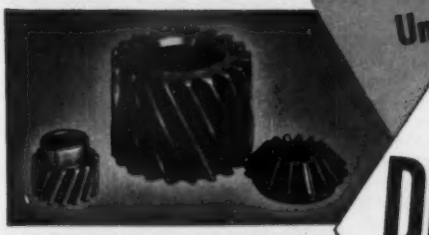

DIVERSEY EVERITE

Rust and Heat-Scale Remover

Gears courtesy of
Gear Specialties, Inc.
Chicago, Ill.

Steel Gears—Case History

PROBLEM: To remove oil, greases and shop dirt from gears prior to heat treatment and to descale the gears after heat treatment without hydrogen embrittlement and with a minimum of dimensional change. Complete de-rusting of various iron and steel shapes also had to be considered.

PREVIOUS PROCESS: A highly caustic cleaner for the removal of oils and greases. Raw acid for general rust and scale removal. Wire brushing for the removal of heat scale and discoloration from gears susceptible to hydrogen embrittlement and whose dimensional tolerances were very small.

PRESENT PROCESS: Diversey No. 909 for oil and grease removal and Diversey Everite for all descaling and de-rusting operations.

RESULTS: Diversey No. 909 produced decidedly cleaner surfaces than the previously used material and did it in less time! The heat treated work contained no burned oil residues.

The gears which could not be pickled previously due to tendencies for hydrogen embrittlement are safely descaled with Diversey Everite. Wire brushing operations have been eliminated. No attack occurs on the gears in spite of the fact that prolonged pickling is required to remove the heavy scale at the root of the gear teeth. And Everite produces brighter surfaces than were previously obtainable with any method.

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Branch News

Coming Events

MILWAUKEE BRANCH

ANNUAL EDUCATIONAL SESSION AND BANQUET
Saturday, April 28
Schroeder Hotel
Symposium
on Finishing for Defense at 2:00 P. M.
Vincent Mattacotti, Chairman

Speakers: Dr. William Blum, National Bureau of Standards, "Specifications for Defense Plating—Civilian Plating"
Mr. Carroll Hutchison, Nubian Division, The Glidden Company, "Preparation of Metals for Organic Finishing—Specifications"
Mr. Myron B. Diggin, Hanson-Van Winkle-Munning Company, "Plating To Meet Today's Conditions"

Banquet at 7:00 P. M.
Ted Hartshorn, Chairman
Music—Floor Show—Dancing

Tickets from Robert Steuernagel, c/o S. K. Williams Company, 2372 N. 32nd Street, Milwaukee, Wis.

KENNETH R. OLSEN,
Publicity Chairman

12TH ANNUAL NEW ENGLAND REGIONAL MEETING
Saturday, April 28
Hotel Taft, New Haven, Conn.
Technical Session at 2:00 P. M.
Banquet at 7:00 P. M.
Floor Show—Dancing

Tickets from E. V. Collins, Box 127, Bantam, Conn.

H. L. KELLNER

BALTIMORE-WASHINGTON BRANCH

"Job Shop Plating" was the subject discussed by MR. FRANK SAVAGE of Graham, Crowley & Associates, Inc., at the meeting on December 12. He gave some very appropriate advice encouraging platers to maintain simple but significant business records to reveal the true status of their operations and to serve as a basis for valid pricing practice. Several wage-incentive plans were illustrated with specific examples, showing their relative merits as a means to increase output. The speaker concluded with a description of several ingenious automatic devices for tank-level control, tank-*p*H control, etc., which have been found useful in avoiding waste and maintaining top operating efficiency in plating shops.

PRESIDENT STRICKLEN presented a past president's pin to FIELDING OGBURN as a token of the Branch's gratitude for his leadership last year.

A number of suggestions and generally favorable comments were received about the first issue of the *BailiWick*, which will be continued as a monthly news letter to members of the Branch. One suggestion was that a music critic's column be incorporated, but it is doubted that Mr. Hume would be available to us, and who else can you believe?

GEORGE E. BEST, *Secretary*

BALTIMORE-WASHINGTON BRANCH

A. E. S. PRESIDENT W. J. NEILL was the guest of honor and speaker at a dinner meeting on January 9. He spoke first about stream-pollution abatement, and emphasized that it should be regarded as an economic necessity rather than merely a desirable objective. Citing information from his home territory, he stated that damage suits in Columbus, Ohio, have amounted to 4 million dollars, and 6 millions were required for an adequate sewage-treatment plant. He ascribed stream pollution to three sources, namely, sanitary, industrial and soil-erosion wastes. For platers Mr. Neill voiced the opinion that many pollution problems can be solved or alleviated by better housekeeping, with specific waste treatment required for the remainder.

Mr. Neill continued with a discussion of plating on nonconductors. He began by conjuring up memories of his early exposure to plating, one of his first jobs being to plate 10,000 peanuts! He then described in detail the modern techniques employed for plating baby shoes, tobacco leaves, champagne corks, etc.

Continuing with the custom of recent years, KEN HUSTON presented Mr. Neill with a beautifully plated and engraved Pot, thus qualifying him for the Order of the Pot. It was commented that whereas many people have become acquainted with a fur-lined pot, few indeed there be who possess a gold-lined pot such as this one. The gathering for this ceremony was an illustrious one: A. E. S. PAST PRESIDENTS FULFORTH, SLATTERY and HUSTON; F. F. PIERDON, a charter member of the Society; and W. W. CHASE, a charter member and organizer of the Baltimore-Washington Branch. Appropriate to the occasion, a number of photographs were taken to record it for posterity.

A nominating committee consisting of DR. ABNER BRENNER, Chairman; CARL THIEDE and KEN HUSTON was appointed and charged with bringing in a slate of officers for election at the meeting on February 13. The March meeting will be held on the 20th with MR. R. W. COOK of the Brush Development Company speaking on "Faxfilm", a means of examining metal surfaces. "What Happens in a Plating Barrel" will be the topic of Mr. H. J. STRUCKHOFF of Lasalco, Inc., at a meeting tentatively scheduled for April 10.

GEORGE E. BEST, *Secretary*

BOSTON BRANCH

At the meeting on December 7 JOSEPH T. SULLIVAN, Chairman of the Annual Technical Session and Banquet, announced the following committee: Education—HAROLD NARCUS and LEONARD CHESWORTH; Technical Chairman—DR. GEORGE P. SWIFT; Finance—LOUIS J. LOVE; Entertainment—SENATOR FURBUSH; Hotel—WALTER LARSON; Publicity—ARTHUR W. COLLINS; Prizes—LOUIS V. GAGNON; Ladies—ANNE BAKER LOVE; Program—STEVEN BAKER; Spiritual Advisor—MANSON GLOVER.

It was voted that the Boston Branch, in view of its own commitments, is not in position for responsible participation in a New England 3-day regional meeting but will encourage attendance of members and will be happy to participate in the distribution of tickets and arrangements for transportation.

After a movie on aluminum had been shown, MR. R. V. VAN DEN BERG, Director of Finishes of Alcoa Laboratories, New Kensington, Pa., discussed finishing methods for aluminum. Anodizing, coloring, etching, and electroplating were discussed with special attention to the effect of alloying elements. Plating-bath compositions were treated in some detail, as were results of salt-spray and other corrosion tests. A half-hour discussion period followed the exceptionally well presented and very complete talk.

GEORGE P. SWIFT, *Secretary*

BOSTON BRANCH

MR. THEODORE VOYDA of Apothecaries Hall Company, Waterbury, Conn., was the featured speaker on January 4. Discussing "Corrosion of Anodes", he dealt with the various types of nickel anodes, relating composition and *p*H as well as use of anode bags. Zinc anodes were discussed on the basis of chemical composition and behavior of impurities in the bath. Copper was treated from the standpoint of type and application in acid or alkaline baths. Lead anodes in chromium baths were given as the example of insoluble anodes.

Following adjournment, RALPH MCCAHAN and TED EICHSTADT told anecdotes of thirty or more years ago.

GEORGE P. SWIFT, *Secretary*

BRIDGEPORT BRANCH

The Christmas Party at the Harry W. Congdon Post No. 11, American Legion, on December 15 was attended by ninety-nine members and guests. Everyone enjoyed the "Smorgasbord" and refreshments. The hall was decorated in Christmas fashion, and Christmas presents were distributed in grab-bag style. RAY KWASNIK gave a piano presentation of several songs, and later a dance orchestra got a goodly crowd dancing to fine music.

Two applicants were elected to membership.

JOSEPH G. STERLING,
Secretary-Treasurer

CHICAGO BRANCH

The regular monthly meeting on Janu-

ary 12 at the Western Society of Engineers began with dinner at 6:45 P. M. At this meeting the Branch was host to the Chicago Section of the Electrochemical Society, which brought the total attendance to 117.

The speaker, Mr. Walter H. Luce of The Duriron Company, spoke about "Alloys for Handling Corrosive Solutions", a subject of interest to all present. Materials of construction for pumps, piping, etc., were discussed, as well as the alloys most suitable for the various types of solution. Following the well presented talk, the speaker answered numerous questions from the floor.

R. F. Ledford, *Corespondent*

CINCINNATI BRANCH

The year 1950 concluded with a fine turnout on December 27 when the members enjoyed dinner, movies, and an excellent talk about "Brush Finishing" by Mr. Robert Lincoln of The Osborn Manufacturing Company, Cleveland. Mr. Lincoln demonstrated the different types of wheels manufactured by his company, including several wire wheels for burr removal. He explained how special wheels might be used on different radar jobs before the work is hard-chromium plated. At the conclusion of the talk the members joined the speaker in a spirited discussion. A "bull" session followed with The Osborn Manufacturing Company playing host.

Charles Wise,
Secretary

CINCINNATI BRANCH

One of the largest crowds to attend a Cincinnati Branch meeting was on hand January 24, when forty-six members and guests greeted Dr. M. M. Beckwith of The Harshaw Chemical Company. After the usual delicious dinner, which members now anticipate at Cincinnati's Engineering Society, President Ezra A. Blount presented Dr. Beckwith, who took as his subject, "Chasing Impurities". Dr. Beckwith opened his talk by defining impurities as "something out of place". After discussing the work of the A. E. S. Research Projects on impurities in plating solutions, he dealt with the effects of germanium in zinc solution, comparing the quantities of impurities found in pilot-plant runs of Missouri and New Jersey zinc ores over a period of eighteen months. Dr. Beckwith concluded with a discussion of the effect of time and temperature on the growth of precipitates and the differential action of activated carbons in removing impurities. A spirited question and answer period followed.

After a short business meeting at which one membership application was accepted, the members adjourned for refreshments furnished by The Globe Chemical Company, Cincinnati.

Charles Wise, *Secretary*

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DAYTON BRANCH

The regular meeting was held in the Engineers' Club on January 5, with twenty-five members in attendance.

The speaker was one of the Branch's members, Mr. L. A. Critchfield, Chief Chemist and Manager of Quality Control, Standard-Thomson Corporation, Dayton, Ohio. Mr. Critchfield talked on the subject, "Quality Control in the Plating Room". The fundamentals of quality control and how they can be put to use in controlling plating operations were explained. Quality control has proven itself in the speaker's plant and has been a particular aid in these times of shortages and allocations. It has also been a means and furnished an incentive for the plater to keep his plated work at top quality. The discussion that followed showed the interest of the members in this subject, so ably presented by Mr. Critchfield.

A film, "This Is Aluminum", which followed the bauxite completely through to the finished product, was then shown.

R. M. Clinehens, *Secretary*

DETROIT BRANCH

The meeting on January 5 took the form of a joint affair with the local chapter of the Electochemical Society.

Some 300 members of both groups heard Dr. Roy Heath, Manager of the Industrial Detergent Department of Wyandotte Chemical Company, discuss "Electrode Reactions in Metal Cleaning". A graduate of Western Reserve (where he was a National Carbon Research Fellow), Dr. Heath served on the

Heath

Manhattan Project in Chicago prior to joining Wyandotte in 1942. Using slides and charts, he dwelt on the lack of basic research into electrode processes in solutions of high concentrations at high temperatures and current densities. "In a solution of only caustic soda through which high-density current passes", said Dr. Heath, "it may well be that the hydroxyl-ion concentration is so low that actually an acid layer exists around the electrode. This postulation should be thoroughly investigated so that we may have known measurements of the acidity at the electrode at varying concentrations, temperatures, and current densities. . . . The use of radioactive tracers should give relatively quick answers to some fundamental research problems".

E. A. Hahn, who presided, called for a minute of silence in recognition of the sudden death of Carl E. Heussner, one of the Nation's foremost electroplating authorities and a wheel horse of the Detroit Branch.

Preceding Dr. Heath's address, a motion film, "The Human Bridge", was shown, courtesy of the Ford Motor Company. The members of the electroplating group were cordially invited to be guests at the March meeting of the Electrochemical Society, when a mutually interesting speaker was promised.

Several new members of the Branch were introduced by President Hahn.

E. Steegar,
Publicity Chairman

HAMILTON BRANCH

The first meeting of 1951 was held in the Chamber of Commerce Room on January 19. The speaker was one of the Branch's own members, Mr. Harry Marsh of the Berstead Manufacturing Company, Oakville. His talk about "Industrial and Decorative Chromium Plating" was one of the most interesting presented before the Branch.

The speaker drew from a large and varied experience. He described the plating of large rolls, such as are used in the pulp and paper industry. These rolls, weighing

ELECTROPLATING SCHOLARSHIPS

The Joseph B. Kushner Electroplating School of Stroudsburg, Pa., takes pleasure in announcing that the Fulton Asphalt Co. of 165 W. Wacker Drive, Chicago, Ill., has made available to all persons who are interested in advancing in the field of electroplating, two scholarships in ELECTROPLATING-KNOW-HOW, the unique home study course in modern electroplating.

WHAT FULTON ASPHALT CO. SCHOLARSHIP WINNERS RECEIVE

1. A full one year home study course in ELECTROPLATING-KNOW-HOW (Value: $97.50), under the direct personal supervision of Joseph B. Kushner.
2. On completion of the course a Certificate is awarded by the School, licensed by the Department of Public Education of the Commonwealth of Pennsylvania. This Certificate is recognized by management throughout the industry as the mark of a plating technician who has been trained to **think** as well as do plating.

WHO CAN APPLY FOR THESE SCHOLARSHIPS

Any person who has the equivalent of at least a grammar school education can apply for one of these scholarships.

HOW THE SCHOLARSHIPS WILL BE AWARDED

The scholarships will be awarded on the basis of the following simple competition: Each applicant will complete, using fifty words or less, the following statement:

"Electroplaters should be able to THINK plating as well as do plating, because . . ."

The writers of the two statements judged best because of integrity, sincerity and originality of thought (fancy rhetoric will not count) will be awarded the Scholarships.

SCHOLARSHIP CONTEST JUDGES

The Judges of this competition will be: Ezra Blount, Editor of PRODUCTS FINISHING; George B. Hogaboom, Metal Finishing Consultant; Walter A. Raymond, Editor, METAL FINISHING; Gustaf Soderberg, Editor, PLATING.

HOW TO GET SCHOLARSHIP CONTEST RULES

For complete contest rules (Contest closes May 20, 1951), a description of the unique home study course, ELECTROPLATING-KNOW-HOW and some ideas that will help in formulating a statement, write directly to ELECTROPLATING-KNOW-HOW SCHOLARSHIP CONTEST, BOX 230, STROUDSBURG, PA.

as much as ten tons, are only partially submerged during treatment and are slowly revolved so that the surface is kept wet at all times. They are subjected to a reverse current etch for 15–20 minutes. If any pits or holes appear during plating, they are drilled out and plugged with steel rod. Before the roll is returned to the plating tank, muriatic acid is poured over it until it has turned black, and the roll is rinsed. Other subjects dealt with were porous-chromium plating of cylinder walls of engines, and etching of rolls with designs for wall paper and oil cloth printing. Questions were posed by the members throughout the lecture, and all were answered satisfactorily.

A dinner-dance was held at Mundy's El Mara, in place of the regular December meeting. Such an enjoyable evening was had that arrangements have already been made for another Ladies' Night next year.

JOHN HARDEN, *Correspondent*

HARTFORD BRANCH

The regular monthly meeting was held in the Bond Hotel on January 15 with sixty-two members and guests present. Through the courtesy of the U. S. Bureau of Mines a movie, "Magnesium", was shown before the meeting.

As part of the technical papers contest, two more papers were given: "Zinc Plating Ideas" by MR. RALPH MCCAHAN, and "Elimination of Reracking by Use of Auxiliary Chrome Anodes" by MR. SALVATORE SANTORO of the Nutmeg Chrome Corporation.

The main speaker was MR. GEORGE B. HOGABOOM, whose subject was "The Effect of the Base Metal on the Deposit". Mr. Hogaboom stressed the importance of knowing not only the impurities in a plating bath but also the base-metal characteristics and properties and their influence on the plated deposit. Microstructures of brass, copper and iron as cast, rolled, annealed, etc., were shown to illustrate grain size and crystal structure. It was demonstrated how grain size influences the drawing of brass, causing the orange-peel effect which requires more buffing for smoothing and makes plating more difficult. That the structure of the base metal influences the structure of the deposit was illustrated by slides showing copper on cast and rolled copper, copper on brass, tin on annealed copper, etc. It was also shown how worked surfaces, drawing compounds, inclusions, oxide films, etc., cause poor adhesion.

MR. SIMONS was technical chairman, and refreshments were served through the courtesy of Oakite Products, Inc.

STANLEY PLATOZ,
Secretary

LANCASTER BRANCH

With thirty members present on January 12, Librarian RAY VINES introduced MR. CLARENCE H. SAMPLE of The International Nickel Company, New York City.

Discussing "Specifications and Tests for Electroplated Coatings", Mr. Sample stated that the purpose of a specification is to tell a plater what is wanted by a customer and to describe the methods of tests. There are two types of specifications, the process type which is used in the plating shops to describe the manufacturing process, and the end-point type, which is used in purchasing contracts. The latter should cover the following properties: thickness, porosity, adhesion, ductility, hardness, luster, stress.

In conclusion, Mr. Sample showed slides of corrosion tests being conducted on different types of deposits in different localities.

HARRY A. SAYLOR,
Secretary

LOS ANGELES BRANCH

The dinner meeting on December 13 was preceded by a meeting of all 1951 Convention Committee Chairmen who reported the progress made towards the success of the Los Angeles Convention.

At the meeting itself MR. JACK WINTERS, Research Chemist, R. O. Hull & Company, spoke about "Conservation of Plating Materials". His talk covered sources of metal-and-solution loss from cadmium, cyanide zinc, bright nickel, and

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CASE HISTORIES

Actual Reports Available on Request

Eliminating Peeling on Chrome Plated Admiralty Brass Antennas, and Cutting Electrocleaning Costs in Half

Parts Cleaned: Admiralty brass tubing after buffing and prior to nickel and chrome plating.

Former Method: Direct and reverse current cleaning, using an alkaline cleaner.

Present Method: Parts from automatic buffing machines are charged in the electrocleaning tanks with Magnus 25, plus a small amount of Magnus NX. Direct cleaned for one minute and reverse cleaned for 15 seconds, tubing is then rinsed, hot and cold, given a muriatic acid dip, cold rinsed, then bright nickel and chrome plated.

Result of Operation Change: Peeling, which was a serious trouble with the former method, has been virtually eliminated. The cleaning is done by #25, the NX being added to provide added wetting action and faster, more thorough rinsing.

Instead of dumping the cleaning tanks every week, they operate the Magnus 25 solution for two weeks.

This firm also cleans steel parts for cadmium plating. After the successful results on the above mentioned operation, they tried Magnus 25 with NX on these steel units. Direct current cleaned for one minute and reverse cleaned for one minute, parts are then hot rinsed, acid dipped, cold rinsed and cadmium plated. These solutions also last twice as long as when the former cleaner was used.

Magnus 25 is only one of the many specialized Magnus Cleaners developed for electrocleaning. One of these will clean your parts better and more economically, whatever metal or combination of metals they may contain . . . whatever your local water conditions may be . . . and whatever type of cutting, drawing or buffing compounds you use. A test run with samples of your parts in the Magnus Laboratory will quickly determine the Magnus product best suited to your needs. Why not use this service—without obligation?

For information write Magnus Chemical Co., 41 South Ave., Garwood, N. J. In Canada—Magnus Chemicals Ltd., Montreal 36, Que. Service representatives in all principal U. S. cities.

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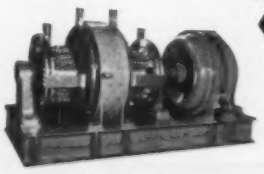
COLUMBIA



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chromium solutions. He also showed a series of colored slides of Hull Cell panels and explained how these panels could be used to control the baths. Mr. Winters answered a number of questions from the floor, and a lengthy discussion followed.

Colored movies were shown of the recent eruption of the Mauna Loa volcano in Hawaii. Taken from an airplane by member Leo Atimion during his trip to Hawaii, they depicted the various lava flows and walls of fire coming down the mountainside to the sea. Everyone was impressed, and Mr. Atimion answered numerous questions by the members.

The Branch was happy to initiate seven new members.

GEORGE MCDONALD, *Secretary*

LOS ANGELES BRANCH

The January dinner meeting was held at the Rodger Young Auditorium on January 10. Eighty-eight members and six visitors provided one of our largest turnouts to date. The Branch was happy to receive three new members.

MR. EARL ARNOLD of the L. H. Butcher Company spoke about "Conversion Coatings for Zinc and Cadmium". Stressing the importance of these coatings in view of the nickel and copper shortage, he outlined the various steps and precautions in their application. He explained how conversion coatings may be had clear or in various colors and that the colored coatings are generally more resistant to corrosion. The coatings, in gel form, are obtained by simple dips in solutions of chromic acid or dichromate along with other agents. Careful attention to rack coatings, tank linings, and drag-in are necessary to prevent contamination. After his talk Mr. Arnold answered questions pertaining to stripping, paint adhesion, Government specifications, and corrosion resistance.

GEORGE MCDONALD, *Secretary*

MILWAUKEE BRANCH

The seventy-six members and guests who turned out to welcome MR. GUSTAF SODERBERG, Editor of PLATING, to the January meeting were treated to an excellent lecture on "Zinc and Cadmium Plating—A Review". Mr. Soderberg presented a scholarly discussion of the subject, adding many interesting and humorous footnotes to the prepared text. The copy of his "Review" that each member received will be a ready reference to the subject.

Two applicants were elected to membership.

Refreshments were served through the courtesy of MR. R. F. MCGUIRE of the Donald Sales Company.

E. E. PIELLUSCH,
Secretary-Treasurer

MONTREAL BRANCH

The Branch held its January meeting

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AT LAST!...

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MICCROSTOP stop-off lacquer is the first lacquer to be developed that will hold a hair line of demarcation through boiling cleaners, acid rinses and all selective plating cycles. It permits a degree of accuracy that has never before been possible.

MICCROSTOP stop-off lacquer was developed by the Michigan Chrome and Chemical Company research laboratories from new synthetic resins. It has excellent dielectric strength—is absolutely neutral—will not contaminate any plating solution nor etch the finest polished or lapped surfaces. May be brushed, dipped or sprayed—possesses rapid air-drying qualities.

The plating industry has long needed this sure stop for stop-off—another MICCRO first.

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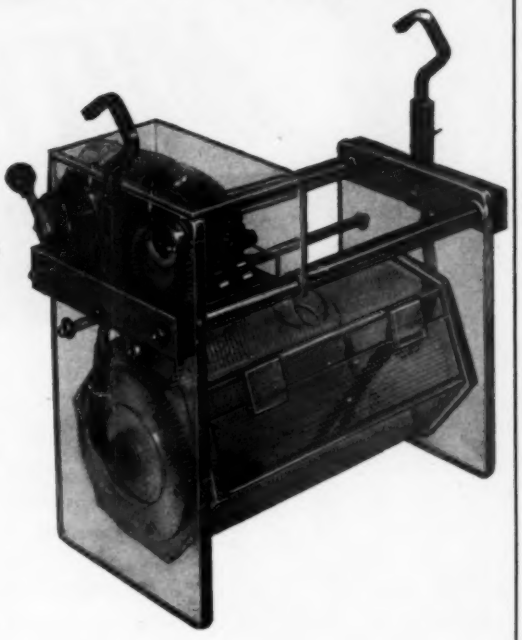

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Branch News

on the 9th with forty-eight members and guests attending.

The president introduced the speaker, Mr. W. Seilers of Dow Chemical Company, who gave one of the most interesting talks the Branch has heard for many months. Without mentioning manufacturers and supply houses, in other words, wholly impartially Mr. Seilers covered the subject of vapour d. greasing from the first make of degreasers to the English patent of 1927 which furnished the basic design of today's units. Methods of heating, solvent boiling points, soil saturation points, breakdown temperatures, etc., were covered thoroughly. Siting of degreasers and how to reduce loss of solvent were explained. A question period followed.

The Board of Managers submitted nominations for officers, after which nominations were made from the floor. Elections are to be held in February. There was one election and one reinstatement to membership.

Walter Ramsbottom, member of the Branch, has been missing for the past two months. Will anyone knowing his whereabouts or having any information kindly forward it to the undersigned?

Wm. Glover, *Secretary*

NEWARK BRANCH

Over 400 members and guests assembled for the Annual Christmas Party. John De Vries and George Wagner acted as co-chairman. A delicious roast-beef dinner was served and was followed by a delightful hour of five acts of vaudeville. Paul Oldam did a good job as master of ceremonies for the floor show. At the educational session President Myron B. Diggin gave a short welcoming address and asked a dozen or more of the visitors from outside Branches to say a few words. Dr. A. K. Graham, A. E. S. Executive Secretary, was the chief representative of this group. His comments about subject matter presented in the papers which followed were welcomed and enjoyed by all.

Librarian Robert Horrocks introduced the speakers, Dr. W. A. Wesley of The International Nickel Company and Mr. H. E. Shearer of the Keystone Lamp Manufacturing Corporation. The former dealt with "Porosity and Its Effects in Electroplating" and the latter with "Brass Plating". Both presentations were well received, and many questions were asked of both speakers.

A color movie, "Unfinished Rainbows", sponsored by the Aluminum Company of America, was shown. Its principal part was devoted to the struggles of Charles M. Hall in the developmental work of preparing aluminum from bauxlite and cryolite.

George Wagner, *Secretary*

NEW HAVEN BRANCH

The Branch held its third meeting of introductory courses in plating on November 14.

Technical Chairman Henry J. Creamer introduced Mr. Arthur W. Logozzo, A. E. S. Past President and President of the Nutmeg Chrome Corporation, Hartford, Conn. An honor student in chemistry courses sponsored by the Branch back in 1937, Mr. Logozzo needed no introduction. His talk and color pictures on "Decorative and Hard Chromium Plating" is one of the finest for both the new and the experienced plater, dealing as it does with everyday plating-room experience: good housekeeping, rack design, healthy solutions by filtering and analytical control. His color picture gives the average plater who can't travel around a good look at the other fellow's successes and headaches. It is hoped that others will be encouraged to make other pictures of actual plating-room procedures.

B. J. Gaffney,
Secretary-Treasurer

NEW YORK BRANCH

The Branch held only one meeting during December because of the approach-

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For a Short Cut to Final Electro Cleaning

S E C WILL SOLVE YOUR CLEANING PROBLEMS

1. **It has no equal for removing stubborn soils.**
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"We can't make all the cleaners so we make the best."

ing holiday season. At this meeting there was a record turnout of members and guests to hear Messrs. MARTIN and MAHLSTEDT of United Chromium, Inc.

The topic of their talk was the new self-regulating chromium solution, including method of operation and advantages over the conventional chromium bath.

Refreshments were served at the close of the meeting.

GRACE ARONSON,
Recording Secretary

PITTSBURGH BRANCH

A very enjoyable meeting was held in the Sheraton Hotel on January 11. After dinner, PRESIDENT ED SMITH opened the business meeting with a short talk encouraging everyone to take an active part in the drive for new members. The treasurer reported that the Executive Committee had decided to present at the February meeting amendments to the By-Laws making honorary membership in the Branch possible.

SAM JOHNSTON introduced a motion, carried by unanimous vote, that the Branch contribute $125 to the A. E. S. Research fund. BILL HENNESSY reported that the campaign to elect FRANK KELLER an A. E. S. officer was getting under way.

Members of the Branch observed one minute of silence in memory of the late CARL HEUSSNER, and the Secretary was instructed to convey the Branch's deep sympathy to MRS. HEUSSNER and to the Detroit Branch.

The thirty-four members present then enjoyed a very informative talk on barrel burnishing by MR. N. L. WATKINS of the Almco Division of the Queen Stove Works. A lively discussion period followed, and everyone seemed disappointed that the meeting had to be brought to a close.

J. D. PATRICK, *Secretary*

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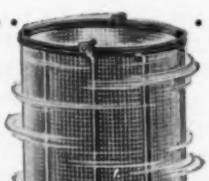

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No scarring or marring . . . with Kreider Dryer. Centrifugal force holds parts immovable in basket . . . assures smooth, evenly dried surfaces, long-lasting luster, minimum "rejects".

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(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

PROVIDENCE-ATTLEBORO BRANCH

The January meeting was held on the 15th at the new meeting place in the Providence Engineering Society Hall, 195 Angell Street, Providence, R. I.

An inquiry from the Regional Committee as to a larger Regional Meeting was received with favor.

A Nominating Committee, consisting of DR. E. A. PARKER, J. P. CLARNER and ARTHUR WOOD, was named and instructed to present a slate of officers for the coming year. JOHN HENRY was appointed as chairman of the Spring Frolic to be held in June and will choose his own committee.

PRESIDENT RAYMOND MITCHELL then introduced the speaker, MR. E. REDLHAMMER of Bart Messing Corporation, Belleville, N. J. Discussing "Rectifiers", he gave an excellent resume of new developments in the field and made a few predictions of what can be expected in the future. A short question period followed.

F. W. BOOTHROYD, *Secretary*

ROCHESTER BRANCH

The January meeting was held at the Rochester Institute of Technology on the stormy evening of the 15th. A better than average attendance of thirty members and guests were present.

Discussion during the business meeting revolved chiefly around a report presented by JOE HULL of Hawkeye on ways and means of securing support and publicity from Rochester industries. No final decision was made; however, many excellent suggestions were presented.

The speaker was MR. H. C. IRVIN of Allied Research Products, Inc., who discussed the nature and formation of chromate films on zinc, cadmium, and other metals. His remarks were received with great interest.

WALTER F. SWANTON, *Secretary*

ST. JOSEPH VALLEY BRANCH

Thirty-three members and guests attended the dinner and forty-three came to the technical session on January 10.

SECOND VICE-PRESIDENT BAYMAN reported for the Research Committee and, as chairman of the May meeting, asked for suggestions for the Ladies' Night program. There was one application for membership. The Branch voted not to prepare an exhibit for the Convention. The Secretary was instructed to try to get the NPA at Fort Wayne to put all members on its mailing list of regulations and orders.

LIBRARIAN DR. ERNEST WILHELM introduced the speaker, MR. C. W. CARTER of United Chromium, Inc. Mr. Carter's concise lecture on "Rack Coatings and Stop-Offs" covered the purposes of rack coatings, which are (1) to prevent plating of the rack, (2) to confine the current to the work, (3) to conserve current, (4) to lower rack-maintenance costs. The

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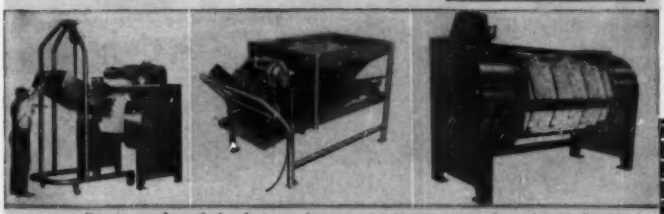

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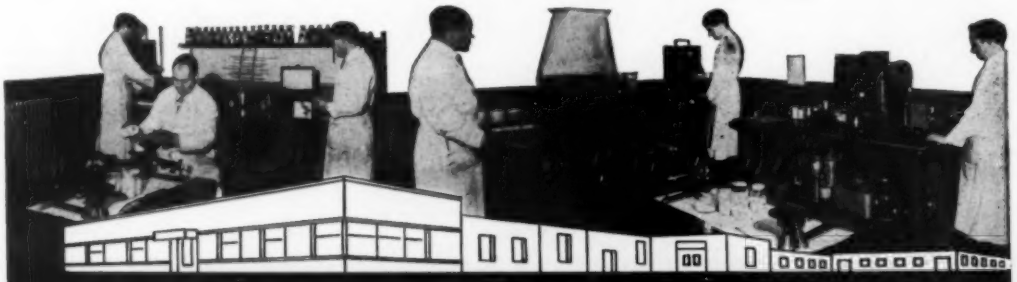

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rack coatings must be such as to (1) resist chemicals, (2) withstand handling, (3) allow for easy application. Various types of rack coatings were dealt with, including dispersion-resin materials commonly known as plastisols.

Materials used as stop-offs, including lacquers and waxes, were also covered, and their use, application, and wearing qualities were described. A very lively discussion period followed on substitute coatings, chromium plating solutions, methods for stripping rack coatings and stop-offs, plating-tank coatings, and many other subjects.

EUGENE ROTH, *Secretary-Treasurer*

ST. LOUIS BRANCH

Members of the Branch were treated to a different type of meeting in January, when more than 100 members and guests toured the new modern plant of American Fixture & Manufacturing Company. ROBERT COULSON, Plating Foreman of American Fixture, had tendered the invitation to his fellow members and had planned the meeting with the cooperation of JOHN NASH, Manager of the Korrect-Way Division of the firm, and IRVIN KEEFER, Manager of Chrome-Craft Division.

Highlight of the tour was the showing of two huge Udylite full-automatic plating machines, each capable of plating a complete dinette set every forty-five seconds. In addition, the many products made by the company were displayed. Dinner was then served in the plant cafeteria.

This was the first of many similar meetings to be under taken by the Branch.

EDWARD HUNLETH, *Secretary*

SOUTHEASTERN BRANCH

The meeting on December 15 in the Georgia Tech Dining Hall, with nine members present, was called to order by VICE-PRESIDENT GRIFFIN. Due to the railroad strike PRESIDENT SLEMMONS and the Spartanburg group could not be in attendance.

The membership committee reported one reinstatement. LIBRARIAN COX reported the schedule of speakers, with DR. WALTER R. MEYER speaking in Jacksonville in February, R. FELLOWS of The Udylite Corporation in Atlanta in March, and A. W. LOGOZZO in Atlanta in April.

The speaker at the meeting was to have been MR. RAYMOND M. SHOCK, Executive Secretary of the National Association of Metal Finishers, Inc. Due to the lack of cooperation between the weather and Eastern Airlines, Mr. Shock failed to arrive.

FRED W. COX, *Acting Secretary*

SOUTHEASTERN BRANCH

A regular monthly meeting was held on

(*Continued on page 297*)

1 ■ 20-MINUTE CLEANING TIME NO MANUAL LABOR NECESSARY

Every Titeflex filter uses a special backwash system which cleans out all residue merely by adjusting a few valves. It is not necessary to dismantle equipment to do a thorough cleaning job.

2 ■ PERMANENT FILTERING ELEMENTS NO REPLACEMENT PARTS REQUIRED

All Titeflex filters are fitted with permanent filtering membranes. Need for costly replacements such as bags, pads, sheets, etc. is entirely eliminated. Operating costs are reduced.

Titeflex specially-designed filtering elements provide filtration areas and higher flow rates unequalled by other filters of similar sizes. The Titeflex backwash system speeds up cleaning, cuts down-time. And for assured operating efficiency each unit is fitted with the *correct* pump for the specific job involved. All those things add up to *faster, lower cost filtering.* Be sure to find out about Titeflex!

SEND FOR NEW BOOKLET

Shows various types of Titeflex filters, lists sizes, capacities and filtering areas of all models. Write today for your free copy.

Titeflex, Inc. 500 Frelinghuysen Avenue, Newark 5, New Jersey

TITEFLEX FILTERS SAVE TIME, LABOR, MATERIALS, MONEY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 241.

Membership Report of the A. E. S.

Elections

ALLENTOWN-READING BRANCH: John Ulrich
BOSTON BRANCH: Philip H. Eisenberg, John Foley, Joseph T. Kinsella
BUFFALO BRANCH: N. A. Bartolo, C. Fotheringham, W. Fotheringham, John Mamon, E. Stefanski
CINCINNATI BRANCH: Elmer Sams
CLEVELAND BRANCH: James W. Canan, Walter T. George, Nick Marsico
DETROIT BRANCH: C. L. Jones, T. R. Williams
HARTFORD BRANCH: Robert E. Joerres, Leo N. Kosowsky, John H. Fairs
LANCASTER BRANCH: George H. Geesey
LOS ANGELES BRANCH: David Althouse, Donald B. Fish, Daniel H. Gelfer, Irving A. Halpern, Robert L. Hungerford.
LOUISVILLE BRANCH: Ray McDaniel, Angus N. McDonald
MILWAUKEE BRANCH: Raymond B. Goodsell, Clifford A. Peter
MONTREAL BRANCH: Sidney J. Chick
PITTSBURGH BRANCH: James E. Bird, Gerald C. Gardner, Clinton F. Rasmussen, Rudolph Spielvogel
ROCHESTER BRANCH: J. Leroy Barker
SYRACUSE BRANCH: Edwin C. Elliott, Angelo Messano
MEMBERSHIP-AT-LARGE: Albert W. Olson

Reinstatements

BALTIMORE-WASHINGTON BRANCH: Orville S. Smith
BOSTON BRANCH: Robert G. Jamieson
MONTREAL BRANCH: Perry Sloane
SPRINGFIELD BRANCH: William F. Hanford
MEMBERSHIP-AT-LARGE: W. H. Sawyer

Transfers

Perry J. Sloane to Waterbury Branch; William R. Porter, Jr., from Bridgeport Branch; Walter A. Raymond from Bridgeport Branch; Alexander Dunetz from Cleveland Branch to Los Angeles Branch; R. M. Norton to Newark Branch; E. L. Faulman to Newark Branch; J. M. Davidson from Pittsburgh Branch; F. E. Lane, A. Larson, Roy H. Thomas, Ernest Weiss from Membership-at-Large to Dallas-Fort Worth Branch; Samuel E. Haggard, Walter Nater, E. L. Whitmore, Jr., from Membership-at-Large to Houston Branch

Resignations

BOSTON BRANCH: Edward Ellis
CINCINNATI BRANCH: Joseph Adler

Membership Competition

BRANCH	Membership* April 1, 1950	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
GRAND RAPIDS	141	6	+17½	+12.4
MILWAUKEE	124	24	+11½	+ 9.3
DETROIT†	483	48	+41½	+ 8.6
NEW YORK	280	22	+23	+ 8.2
CHICAGO	372	40	+28	+ 7.5
BOSTON	142	18	+ 7	+ 4.9
LOS ANGELES	201	30	+ 8	+ 4.8
TORONTO	124	7	+ 3½	+ 2.8
PITTSBURGH	142	6	+ 4	+ 2.8
WATERBURY	125	8	+ 3½	+ 2.8
BRIDGEPORT	155	9	+ 3	+ 1.9
CLEVELAND	195	31	+ 3	+ 1.5
HARTFORD	132	11	+ 2	+ 1.5
PHILADELPHIA	192	19	+ ½	+ 0.3
NEWARK	238	10	− 3½	− 1.5
SECOND GROUP				
MONTREAL	68	10	+ 6½	+ 9.6
MELBOURNE†	111	18	+10	+ 9.0
INDIANAPOLIS	97	14	+ 6½	+ 6.7
CINCINNATI	87	5	+ 3	+ 3.4
BUFFALO	77	6	+ 2	+ 2.6
NEW HAVEN	106	10	+ 2½	+ 2.4
ST. LOUIS	97	9	+ 2	+ 2.1
BALTIMORE-WASH.	85	8	+ ½	+ 0.6
SYRACUSE	85	14	− 2	− 2.4
DAYTON	97	1	− 4½	− 4.6
ADELAIDE	72	4	− 6	− 8.3
PROV.-ATTLEBORO.	112	3	−12	−10.7
TWIN CITY	71	..	− 8	−11.3
ROCHESTER	104	9	−15	−14.4
SYDNEY	109	7	−16	−14.7
THIRD GROUP				
ALLENTOWN-READING	37	7	+ 6	+16.2
ROCKFORD	64	9	+ 9	+14.1
COLUMBUS	47	3	+ 5½	+11.7
ST. JOSEPH VALLEY	66	8	+ 4	+ 6.1
HAMILTON	23	1	+ 1	+ 4.3
WESTERN ONTARIO	23	..	.....	.....
SPRINGFIELD	51	3	− ½	− 1.0
LANCASTER	62	3	− 3	− 4.8
JACKSON-LANSING	57	4	− 3½	− 6.1
SOUTHEASTERN†	54	3	− 4	− 7.4
TOLEDO	49	3	− 4	− 8.2
LOUISVILLE	25	3	− 2½	−10.0
SAGINAW VALLEY	64	5	− 8	−12.5
SAN FRANCISCO	66	10	− 9	−13.6
OUTSIDE COMPETITION				
AT LARGE	104	27	+ 9	.....
IN TRANSFER	27	..	−21	.....
OTHERS	...	..	+ 7	.....
TOTAL A. E. S.	5,236	499	+90	+ 1.7

Active Membership, February 1, 1951 5,326

*Subject to correction. †Winners of membership competition in 1949–1950.

LOUISVILLE BRANCH: Earl F. Taylor
PITTSBURGH BRANCH: Joseph P. Davis
SYDNEY BRANCH: J. Dean, B. T. Crook, H. C. Bowra
MEMBERSHIP-AT-LARGE: J. T. Dinkeloo

Suspensions

PITTSBURGH BRANCH: M. G. Busch, M. Drozd, J. A. Fletcher, L. D. Hawkins, D. M. Haltman, H. W. Kull, J. M. Kulchak, Charles Kolman, L. W. Lord, J. W. Lee, E. M. Polivka, P. T. Thomas, K. Tator, R. J. Zaiden
MEMBERSHIP-AT-LARGE: Richard F. Allen
INCOMPLETED TRANSFERS: Robert C. Axsom, Joseph A. Cappi, Herbert E. Fennell, R. M. Garrison, Charles A. Heavens, S. Allen Heenan, William W. Hunlock, William S. Levine, Robert C. McColgin, F. L. Oldroyd, Peter Pawlyk, W. G. Sheane, J. M. Small, Harry Watters

Deaths

BOSTON BRANCH: William Lawson

Branch News

(*Continued from page 295*)

January 12 in the dining hall of the Georgia School of Technology, with twelve members present.

Librarian Dr. Fred Cox introduced as the speaker of the evening Dr. J. M. Della Valle, Professor of Chemical Engineering at Georgia Tech, formerly with the Health Research of the State of Pennsylvania. Dr. Della Valle held the attention of all present with a most interesting talk on the hazards in the plating room, covering just about every chemical used in the business.

Wm. T. Weymouth,
Secretary-Treasurer

SYRACUSE BRANCH

One hundred members and friends attended the annual Christmas Party on December 13 in the Aurelis Restaurant, Liverpool, N. Y.

All ladies present received a beautiful silver jelly server through the courtesy of Oneida Limited, Sherrill, N. Y. A generous number of door prizes, donated by suppliers and others, produced especially happy smiles on the faces of half of the people. Second Vice-President Ken Parnell announced the winners as Mrs. Art Martineau, Jr., drew the lucky numbers.

Among out-of-town guests were Bill Fotheringham of Buffalo, Mr. and Mrs. Don Blum of Rochester, Ed Elliott of Geneva, and Wes Cassell of Waterbury, Conn.

Art Martineau, Sr., Party Chairman, his committee, and Treasurer Walt Piasecki, are to be congratulated on a job well done.

Lindley S. Wood, *Secretary*

ANNOUNCING
a radically new type of
chromate finish for zinc and cadmium
IRIDITE #8P

NEW LOW MATERIAL COSTS!

Each gallon of working solution you mix costs from as little as 35¢ down to only 8¼¢, depending upon solution concentration and appearance desired. In addition, you get an extra 10% discount on material orders for 2000 pounds or more!

NEW LOW SHIPPING COSTS!

Iridite #8P is shipped to you as a *dry powder* in disposable steel pails. No liquids! No carboys! Saves up to 75% in freight; travels via low Third Class Rates. Pails take less storage space, reduce handling time and costs.

NEW BRIGHT OR GOLDEN FINISH!

A sparkling blue-bright finish results when you use Iridite #8P followed by a simple caustic soda bleach. Or, the coating can be produced as a golden-yellow iridescent film from a single dip by simply decreasing the concentration.

NEW ALL-PURPOSE USE!

New Iridite #8P can be applied by a simple chemical dip to any zinc or cadmium surface . . . plated, diecast, galvanized or sheet. Mixing is easy since the powder dissolves readily into solution. No special equipment or specially trained personnel is needed. Corrosion resistance is determined by the appearance desired; the choice is up to you. But for any appearance you are assured of maximum Iridite quality in corrosion resistant and paint base characteristics.

WRITE FOR FREE TEST SAMPLE or send samples of your product for finishing with new Iridite #8P. See for yourself how this amazing new Iridite treatment can cut your finishing costs.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

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SUSTAINING MEMBERSHIP LIST

As of February 1, 1951

(Figures in parenthesis indicate number of memberships held.)

Acme Plating Company, The
Acme Steel Company
Advance Plating Company, The
Aetna Electroplating Company
Allied Industrial Products, Inc.
Alsop Engineering Corporation
Aluminum Company of America
American Buff Company
American Cabinet Hardware Corporation
American Can Company
American Chemical Paint Company
American Hot Dip Galvanizer's Association, Inc.
American Instrument Company
American Nickeloid Company
American Radiator & Standard Sanitary Corporation
American Smelting & Refining Company
American Wire Fabrics Corporation
American Zinc Institute (5)
Apex Plating Company
Apollo Metal Works
Apothecaries Hall Company
Ardco, Incorporated
Armco Steel Corporation
Arrow-Hart & Hegeman Electric Company
Arrow Plating Company, Inc.
Arvin Industries, Inc.
Auto City Plating Company
Automotive Rubber Company
Bastian-Blessing Company, The
Belke Manufacturing Company
Bell Telephone Laboratories, Inc.
Bendix Products Division, Bendix Aviation Corporation
Berteau-Lowell Plating Works
Bethlehem Steel Company (2)
Blakeslee, G. S. & Company
Briggs Manufacturing Company
Brookline Electro Platers, Inc.
Bruce Products Corporation
Buckeye Products Company, The
Buckingham Products Company (2)
Canadian Hanson & Van Winkle Company, Limited
Casco Products Corporation
Chase Brass & Copper Company
Chemical Corporation, The
Chicago Electro-Platers Institute
Chicago Thrift-Etching Corporation
Chrome-Rite Company (2)
Chromium Corporation of America
Chromium Process Company, The
Chrysler Corporation (2)
Cinch Manufacturing Corporation
Clayton Mark & Company
Cleveland Graphite Bronze Company, The
Clinton Company, The
Clinton Supply Company, Inc.
Codman, F. L. & J. C., Company
Corona Corporation
Cowles Chemical Company
Crane Company
Croname, Incorporated
Crown City Plating Company
Crown Cork and Seal Company
Crown Rheostat and Supply Company
Darco Corporation
Davies Supply & Manufacturing Company
Daystrom Corporation
Detroit Plating Industries
Diamond Alkali Company
Diversey Corporation, The
Dixie Electro Plating Company
Doehler-Jarvis Corporation (2)
R. R. Donnelley & Sons Company
E. I. duPont de Nemours & Company
Dura Div., Detroit Harvester Company
Dura-Chrome of Chicago, Inc.
Eastman Kodak Company (2)
Eaton Manufacturing Company
Ekco Products Company
Electric Auto-Lite Company, The (2)
Electrolux Corporation
Ellmore Silver Company, The
Enthone, Inc.
Erie Plating Company
Felt & Tarrant Manufacturing Company
Finishing Publications, Inc.
Ford Motor Company (5)
Formax Manufacturing Company
Frigidaire Division, General Motors Corporation
Gemex Company
General Electric Company
General Motors Corporation (5)
Gerity-Michigan Corporation
Gillette Safety Razor Company
Gorham Manufacturing Company
Graham, Crowley & Associates, Inc.
Graham Plating Works
Grand Plating Company
Great Lakes Industries, Inc.
W. Green Electric Company, Inc.
Frederick Gumm Chemical Company
C. Hager & Sons Hinge Manufacturing Company
Hall-Mack Company
Hamilton Watch Company
Hammond Machinery Builders, Inc.
Hanson-Van Winkle-Munning Co. (3)
Harding Manufacturing Company
Harshaw Chemical Company, The (3)
Haviland Products Company
Heil Process Equipment Corporation
Heywood-Wakefield Company
Houdaille-Hershey Corporation (3)
Howard Plating Industries, Inc.
Hub Plating Works
Hudson Motor Car Company
R. O. Hull & Company, Inc.
Hy-Grade Electroplating Company
Illinois Watch Case Company
Industrial Filter & Pump Manufacturing Company
International Business Machines Corporation
International Nickel Co., Inc., The (5)
International Silver Company
Jones & Laughlin Steel Corporation
Keeler Brass Company
Kelite Products, Inc.
Kelly Plating Company, The
Knape & Vogt Manufacturing Company
Knight-Morley Corporation
Knight Plating Company
Kocour Company
Kohler Company
Kuehne Manufacturing Company
Lasalco, Inc.
Lea Manufacturing Company, The
Lea Manufacturing Company of Canada, Ltd.
Leeds & Northrup Company
Chas. F. L'Hommedieu & Sons Company
Lyon, Incorporated
Maas & Waldstein Company
W. D. MacDermid Chemical Company
MacDermid, Incorporated
Magnuson Products Corporation
R. C. Mahoney
P. R. Mallory & Company
Manderscheid Company, The
Matchell Metal Polish Company, The
Mattatuck Manufacturing Company
Maurer Supply Company
McGean Chemical Company, The
Meaker Company, The
Mechanical Plating Company
Mercil Plating Equipment Company
B. Mercil & Sons Plating Company
Metal Finishing Association of Southern California, Inc.
Metal Mouldings Corporation
Metal Processing Company
Michigan Bumper Corporation
Michigan Chrome & Chemical Company
J. C. Miller Company
Mitchell-Bradford Chemical Co., The
Modern Plating Company
Modern Plating Company, The
Modern Plating Corporation
Monsanto Chemical Company
Moore Drop Forging Company
Motor Products Corporation
Mutual Chemical Company of America
George L. Nankervis Company
National Aniline Division, Allied Chemical & Dye Corporation
National Brass Company
National Cash Register Company, The
National Lock Company
National Plating Company, Inc., The
National Screw and Manufacturing Company, The
Nelson Chemicals Corporation
New England Buff Company
New England Plating Company
New Jersey Zinc Company (3)

George E. Nichols Plating
G. J. Nicholas & Company
Northwest Chemical Company
Northwestern Plating Works
Nutmeg Chrome Corporation
Oakite Products, Inc. (2)
Oneida, Ltd.
Packard Motor Car Company
Parker Rust Proof Company
Pennsylvania Salt Manufacturing Company, The
Perma-Line Rubber Products Corporation
Pheoll Manufacturing Company
Philco Corporation
Platers Supply Company
Pronnt Division, Poor & Company
Price-Pfister Brass Manufacturing Company
Products Finishing
R. C. A. Victor Division, Radio Corporation of America
Reilly Plating Company
R. W. Renton & Company
Reynolds-Robson Supply Company (2)
Roberts Rouge Company
G. S. Robins & Company
Roto-Finish Company
Royal Plating and Polishing Company
Sargent & Company
Scientific Control Laboratories
Scovill Manufacturing Company
E. E. Seeley Company, Inc.
Seymour Manufacturing Company, The
J. J. Siefen Company
Standard Plating Rack Company
Standard Plating Works
Standard Steel Spring Company (3)
Stanley Works, The
Studebaker Corporation, The
George A. Stutz Manufacturing Company
Superior Steel Corporation
Sylvania Electric Products, Inc.
Talon, Inc.
Thomas Buff & Brush Company, Ltd.
Thomas Steel Company, The
Trico Products Corporation
Turco Products Corporation
Udylite Corporation, The (3)
United-Carr Fastener Corporation
United Chromium, Inc. (2)
United Manufacturing Company
United Platers, Inc.
United States Spring & Bumper Company
Van Der Horst Corporation of America
A. T. Wagner Company
Wagner Brothers, Incorporated
Wald Manufacturing Company
Walton & Lonsbury
Warner Electric Company
Waterbury Plating Company
Weirton Steel Company
Western Electric Company
Western Rustproof Company
Westinghouse Electric Corporation
Wheeler Industries, Inc.
Whitfield Chemicals
Winchester Repeating Arms Company
Winters & Crampton Corporation
Wollensak Optical Company
Worcester Brass Electro Plating Company
Wyandotte Chemicals Corporation
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BETTER THAN EVER

The True Insulator will give you more safety than before with the same standard of insulation as always. Wire braid hose on the ¾" and 1" sizes insures absolute freedom from failure. The ½" size has been completely redesigned to give higher quality with longer life. With all these improvements the True Insulator is a better bargain than ever.

THE TRUE INSULATOR

is specifically manufactured to insulate your plating operations from grounds and short circuits through the heating coils, cooling coils, air agitation systems or other pipe connections. The True Insulator provides more positive insulation than any other type known.

Available in following sizes

½ inch.....$7.00 per pair
¾ inch.....$7.50 per pair
1 inch.....$8.50 per pair

Quality Discounts

TRUE BRITE CHEMICAL PRODUCTS

P. O. Box 31, Oakville, Conn.

PRACTICAL PRODUCTS FOR PRACTICAL PEOPLE

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 243.

Looking for a Better Finish?
Try
HARRISON'S

4A

TAILOR-MADE
BUFFING AND POLISHING COMPOUNDS
for
Aluminum, Brass, Copper, Stainless Steel, Carbon Steel, etc.

EMERY CAKE, GREASE STICK

CEMENT AND THINNER
for setting up wheels, belts and rolls

HARRISON & COMPANY, Inc.
HAVERHILL, MASSACHUSETTS

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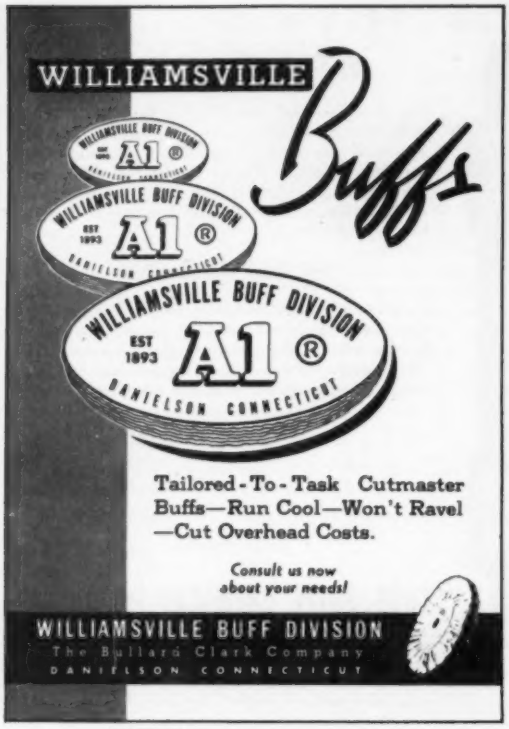

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NICKEL ANODES . . . *12,000 pounds*

NICKEL SALTS... *16,000 pounds* **FOR SALE**

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DOMESTIC **"VIENNA"** LIME
(DOLOMITIC)
ABRASIVE FOR USE IN
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Inquiries—Domestic and Foreign—Solicited

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A. E. S. Directory

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Columbus Metal Products, Inc.
1341 Norton Avenue, Columbus 12, Ohio

First Vice-President.....C. F. NIXON
Ternstedt Division, G. M. C.
6307 W. Fort Street, Detroit 9, Mich.

Second Vice-President.....F. J. MacSTOKER
Farrand Optical Company, Inc.
4401 Bronx Boulevard, Bronx, N. Y.

Third Vice-President.....Dr. G. P. SWIFT
53 Galen Street, Watertown 72, Mass.

Past President.....A. W. LOGOZZO
Nutmeg Chrome Corporation
79 Chapel Street, Hartford 3, Conn.

Executive Secretary.....Dr. A. K. GRAHAM
P. O. Box 168, Jenkintown, Pa.

A. E. S. RESEARCH COMMITTEE

Chairman.....Dr. W. A. WESLEY
The International Nickel Co., Inc., Bayonne, N. J.

Secretary.....The Executive Secretary

LOCAL BRANCHES (With Changes Only)

CHICAGO meets second Friday of each month at 8 P. M. at Western Society of Engineers, 84 E. Randolph Street. Secretary-Treasurer, Paul Glab, 882 N. Paulina Street, Chicago, Ill. Research Finance Committee Chairman, R. F. Ledford, c/o Hanson-Van Winkle-Munning Company, 2910 Carroll Avenue, Chicago 12, Ill.

CINCINNATI meets fourth Wednesday of each month at 8 P. M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary, Charles Wise, c/o The Buckeye Products Company, 7020 Vine Street, Cincinnati 16, Ohio.

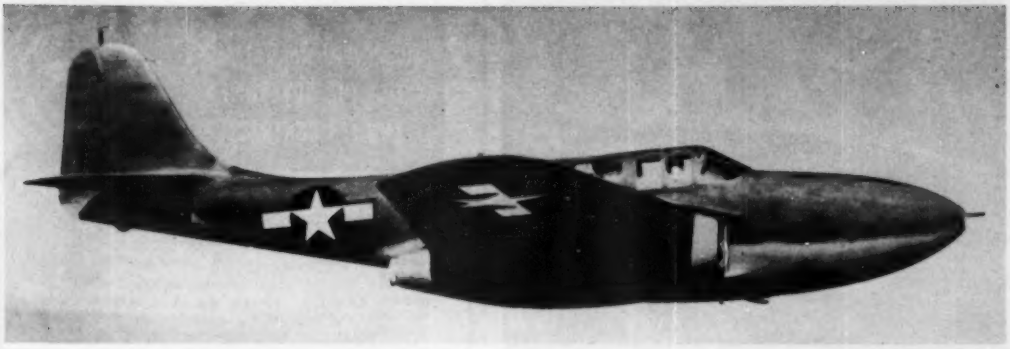
PROVIDENCE-ATTLEBORO meets third Monday of each month in Providence Engineering Society Hall, 195 Angell Street, Providence, R. I. Secretary, Frank W. Boothroyd, 51 Barber Avenue, Apponaug, R. I. Research Finance Committee Chairman, Pierre B. Lonsbury, 78 North Avenue, Attleboro, Mass.

SAGINAW VALLEY meets for dinner at 7 P. M. and meeting at 8 P. M. at Zenders, Frankenmuth, Mich., second Wednesday of each month, September through May except February. Secretary-Treasurer, Alfred Muehlenbeck. 1141 Beech Street, Saginaw, Mich. Research Finance Committee Chairman, Alfred Knight, 113 S. Farragut St., Bay City, Mich.

SAN FRANCISCO meets second Thursday of each month, alternating between El Jardin Restaurant, 22 California Street, San Francisco, and El Curtola Restaurant, 510 17th Street, Oakland. Secretary-Treasurer, Roy Fellom, Jr., 709 Mission Street, San Francisco, Calif. Research Finance Committee Chairman, Alan Baker, 10 Bluxome St., San Francisco, Calif.

SOUTHEASTERN meets second Friday of each month in Robert Fulton Hotel, Atlanta, Ga. Secretary-Treasurer, William Weymouth, 173 Clay Street, S. E., Atlanta, Ga. Research Finance Committee Chairman, Dr. Fred W. Cox, Engineering Experiment Station, Georgia School of Technology, Atlanta, Ga.

ST. JOSEPH VALLEY meets first Wednesday of each mouth at 8 P. M. in Hotel Elkhart, Elkhart, Ind. Secretary-Treasurer, Eugene Roth, 1720 Mishawaka Avenue, South Bend 15, Ind. Research Finance Committee Chairman, J. C. Bayman, 1430 E. Madison Street, South Bend, Ind.



N.E.A. NEWS PHOTO

Announcing—

ROHCO Packaged PROCESS

for

Aircraft Black Cadmium Dip

- WORKS SIMPLY AND RAPIDLY!
- ADHERENT BLACK GIVES EXCELLENT RESISTANCE TO SALT SPRAY!

ROHCO

ROHCO PRODUCTS

NO-CRO-MIST • HULL CELL TEST • ROHCO 20XL CADMIUM BRIGHTENER ROHCO 100 BARREL AND 303 STILL ZINC BRIGHTENERS • RINS-AID BLACK CADMIUM DIP • CROMETER

R. O. HULL & CO., INC.
1302 Parsons Court
Rocky River 16, Ohio

Canada: Armalite Company, Ltd.
Toronto 6, Canada

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"

FREE—JUST PIN THIS COUPON TO YOUR LETTERHEAD!

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1302 Parsons Court
Rocky River 16, Ohio

Gentlemen:

Please send us on our order ROHCO Packaged Process Aircraft Black Cadmium Dip for ☐ 10 gallons ☐ 25 gallons

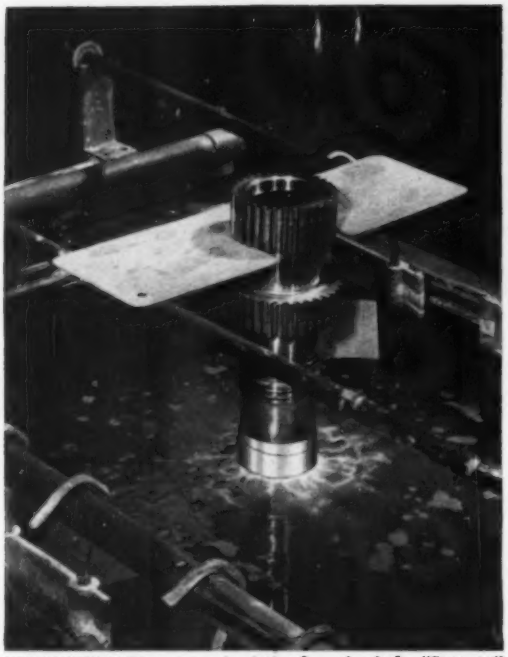
Name.....

Company.....

Street Address.....

City.....Zone.....State.....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 248.



HOT CAUSTIC BATH removes tin plating from the shaft. "SCOTCH" Pressure-Sensitive Tape No. 470 masks off parts which must be protected from destructive action of the caustic.

Tough plastic tape stops hot, tin-eating caustic!

At Northwest Airlines, tin plating is removed from engine impeller shafts prior to reconditioning and re-plating. Here's how "SCOTCH" Pressure-Sensitive Tape No. 470 makes the job easier and faster.

Plastic backing of this tape conforms snugly to odd-shaped and irregular surfaces, withstands both caustics and acids. Cleaning and plating solutions can't creep under tape's strong adhesive. Result: clean, sharp jobs every time. And "SCOTCH" Pressure-Sensitive Tape No. 470 is easy to apply, too. Needs no special equipment, no skilled labor.

Let us show you how this unique plating tape can save you money. We'll be glad to have a sales engineer call. Just write Dept. P-3.

The term "SCOTCH" and the plaid design are registered trade-marks for the more than 100 adhesive tapes made in U. S. A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn. . . . also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives, "3M" Adhesives.

General Export: Durex Abrasives Corp., New Rochelle, N. Y.
In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

SPECIFICATION CHEMICALS FOR THE GOVERNMENT AND ITS CONTRACTORS

STANDARD RUST PROOFING PRACTICE THE WORLD OVER — CHEMICALS ACP PROCESSES

PHOSPHATIZING, RUST PROOFING AND PAINT BONDING CHEMICALS

Specification Number	ACP Specification Chemical
QQ-P-416	"Lithoform"
	"Zinodine"
RR-C-82	"Lithoform" No. 32
MIL-C-5541 (See also QPL-5541-1)	"Alodine"
MIL-S-5002	"Alodine"
	"Granodine"
JAN-C-490, Grade 1	"Granodine"
JAN-F-495	"Granodine"
	"Lithoform"
JAN-L-548	"Permadine"
AN-E-19	"Alodine"
	"Zinodine"
AN-F-20	"Alodine"
	"Granodine"
	"Lithoform"
	"Permadine"
	"Thermoil-Granodine"
	"Zinodine"
	(See also U. S. A. 3-213)
U. S. A. 57-0-2	
Type II, Class A	"Thermoil-Granodine"
Type II, Class B	"Permadine"
Type II, Class C	"Granodine"
U. S. A. 51-70-1	
Finish 22.02, Class A	"Thermoil-Granodine"
Finish 22.02, Class B	"Permadine"
Finish 22.02, Class C	"Granodine"
U. S. A. 50-60-1	"Granodine"
U. S. Navord O.S. 675	"Alodine"
U. S. N. Appendix 6	"Lithoform"
Navy Aeronautical M-364	"Permadine"
	"Thermoil-Granodine"
16E4 (Ships)	"Alodine"
	"Granodine"
	"Zinodine"
AN-C-170	(See MIL-C-5541)
U. S. A. 72-53	(See AN-F-20)
AXS-1245	(See JAN-C-490)

RUST REMOVING AND METAL CONDITIONING CHEMICALS

Specification Number	ACP Specification Chemical
JAN-C-490, Grade II	
Type 4	"Deoxidine" Nos. 126, 512, 526, 624, 670
Type 5	"Deoxidine" Nos. 170, 171, 670
MIL-C-10578	
Type I	"Deoxidine" (Wash-off)
Type II	"Deoxidine" (Wipe-off)
U. S. A. 98-20007	"Deoxidine" No. 424
U. S. N. Appendix 6	"Deoxidine"
U. S. A. 3-213	(See MIL-C-10578)

METAL CLEANING CHEMICALS

Specification Number	ACP Specification Chemical
JAN-C-490 Grade II	
Type 2	"Ridoline"
Type 6	"Ridosol"
U. S. A. 3-192	"Ridoline" No. 3192

ACID INHIBITORS, PICKLING

Specification Number	ACP Specification Chemical
U. S. N. 51-1-2	"Ridine"

Additional copies of this chart and descriptive folders on the ACP Specification Chemicals listed above are available on request.

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Advertising Index

ABBOTT BALL COMPANY, THE 278
Agency: R. H. Young & Associates
ACME MANUFACTURING CO., INC. 223
Agency: Rex Dye
ADAMS ENGINEERING COMPANY 271
Agency: Harry M. Frost Company
ALLIED RESEARCH PRODUCTS, INC. 226, 297
Agency: Emery Advertising Corporation
ALMCO DIV., QUEEN STOVE WORKS, INC. 293
Agency: Weston-Barnett, Inc.
AMERICAN CHEMICAL PAINT COMPANY 302
Agency: May Advertising Company
AMERICAN ELECTROPLATERS' SOCIETY 267
AUTOMOTIVE RUBBER COMPANY, INC. 235
Agency: Burke Bartlett Company, Inc.

BAER COMPANY, THE KURT A. 300
BAKER, M. E., COMPANY 234
BELKE MANUFACTURING COMPANY 217
Agency: Allbright Associates
BLAKESLEE, G. S., & COMPANY 214
Agency: Lauesen & Salomon
BURNS, E. REED, MFG. COMPANY 275
Agency: Elwood S. Allen Advertising

CHEMCLEAN PRODUCTS CORPORATION 291
CHEMICAL CORPORATION, THE 234, 278
Agency: Wm. B. Remington, Inc.
CHEMSTEEL CONSTRUCTION CO., INC. 275
Agency: Smith, Taylor & Jenkins, Inc.
CHURCHILL, GEORGE R., COMPANY, INC. 270
Agency: Harry M. Frost Company
CODMAN, F. L. & J. C., COMPANY 212
Agency: Sanderson Brothers
COLUMBIA ELECTRIC MFG. COMPANY 286
Agency: Meermans, Inc.
COWLES CHEMICAL COMPANY, THE 209
Agency: The Bayless-Kerr Company

DARCO DEPT., ATLAS POWDER COMPANY 222
Agency: The Aitkin-Kynett Company
DIVERSEY CORPORATION, THE 281
Agency: Cruttenden & Eger Advertising

EDMONT MANUFACTURING COMPANY 271
Agency: Mumm, Mullay & Nichols, Inc.
ENTHONE, INCORPORATED 207
Agency: Peck Brothers
EXOLON COMPANY, THE 277
Agency: Melvin F. Hall Adv. Agency, Inc.

FORMAX MANUFACTURING COMPANY 266
Agency: Brindley-Roth, Inc.

W. GREEN ELECTRIC COMPANY, INC. 208
Agency: Shappe-Wilkes, Inc.
GUMM, FREDERICK, CHEM. CO., INC. ..... Second Cover
HANSON-VAN WINKLE-MUNNING CO. ..... Fourth Cover
Agency: O. S. Tyson & Company, Inc.
HARRISON & COMPANY, INC. 299
HARSHAW CHEMICAL COMPANY, THE 238
HENDERSON BROTHERS COMPANY, THE 220
Agency: The Taylor & Greenough Company
HOLLAND, J., & SONS, INC. 272
Agency: Norman D. Waters & Associates, Inc.
HULL, R. O., COMPANY, INC. 301
Agency: Ralph M. French Advertising

INDUSTRIAL FILTER & PUMP MFG. CO. 218
Agency: The Advertising Corporation
INDUSTRIAL PRODUCTS COMPANY 274
Agency: The Stewart-Jordan Company
INTERNATIONAL NICKEL COMPANY 279
Agency: Marschalk & Pratt Company

KOCOUR COMPANY 304
Agency: DeCasseres & Associates
KUSHNER, JOSEPH B. 270, 284

LAND, L. J., INC. 272
LEA MANUFACTURING COMPANY 225
Agency: Sanger-Funnell, Inc.
L'HOMMEDIEU, CHARLES F., & SONS CO. 211

MAAS & WALDSTEIN COMPANY 216
Agency: The Franklin Fader Company
MAC DERMID, INCORPORATED ..... Third Cover
Agency: The Callaway Associates
MAGNUS CHEMICAL COMPANY 286
Agency: Spooner & Kriegel
MAGNUSON PRODUCTS CORPORATION 228
Agency: George Wilfred Wright
MEAKER COMPANY, THE 227
Agency: The Advertising Corporation
MICHIGAN BUFF COMPANY 276
MICHIGAN CHROME & CHEMICAL COMPANY 289
MINNESOTA MINING & MFG. COMPANY 302
Agency: Batten, Barton, Durstine & Osborn, Inc.
MUTUAL CHEMICAL CO. OF AMERICA 230
Agency: The House of J. Hayden Twiss

NELSON CHEMICALS CORPORATION 285
NEW HOLLAND MACHINE COMPANY 292
Agency: J. Walter Thompson Company
NORTHWEST CHEMICAL COMPANY 294
Agency: Hyatt Eby Advertising

OAKITE PRODUCTS, INC. 269
Agency: Rickard & Company, Inc.

PENNSYLVANIA SALT MFG. COMPANY 219
Agency: Geare-Marston, Inc.
PHELPS DODGE REFINING CORPORATION 276
Agency: Atherton & Currier, Inc.
PLATERS RESEARCH CORPORATION 278
Agency: State Advertising Service
PROMAT DIVISION, POOR & COMPANY 231
Agency: Russell T. Gray, Inc.

ROCKWELL LIME COMPANY 300
ROTO-FINISH COMPANY 210
Agency: The Jaqua Company, Advertising

SARAN LINED PIPE COMPANY 213
Agency: MacManus, John & Adams, Inc.
SCHAFFNER MANUFACTURING CO., INC. 283
SEELEY, E. E., CO., INC. 272
SEYMOUR MANUFACTURING CO., THE 233
Agency: Claude Schaffner Advertising Agency
SIEFEN, J. J., COMPANY 229
SPARKLER MANUFACTURING COMPANY 224
Agency: Kreicker & Meloan, Inc.
STEVENS, FREDERIC B., INC. 236
Agency: Grant Advertising, Inc.
STORTS WELDING COMPANY, INC. 230
STUTZ, GEORGE A., COMPANY 290
Agency: Sander Rodkin Advertising Agency
SULPHUR PRODUCTS COMPANY, INC. 274

TITEFLEX, INCORPORATED 295
Agency: Robert L. Marloff, Inc.
TRAMER, GILBERT, COMPANY, THE 268
Agency: Claude Schaffner Advertising Agency
TRUE BRITE CHEMICAL PRODUCTS CO. 299

UDYLITE CORPORATION, THE 273
Agency: Grant Advertising, Inc.
UNITED BUFF PRODUCTS CORPORATION 304
UNITED CHROMIUM, INCORPORATED 221, 283
Agency: Rickard and Company, Inc.

WAGNER BROTHERS, INC. 215, 275
Agency: Fred P. Bingham, Technical Adv.
WILLIAMSVILLE BUFF DIV., THE BULLARD CLARK COMPANY 300
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AMERICAN SOCIETY FOR TESTING MATERIALS Spring Meeting and Committee Week in Cincinnati, Ohio on March 5–9.

CONFERENCE ON INDUSTRIAL PERSONNEL at Columbia University, Department of Industrial Engineering, New York City, on March 19–23.

BOSTON BRANCH, A. E. S. Annual Technical Session and Banquet in Hotel Statler, Boston, Mass., on April 7.

MILWAUKEE BRANCH, A. E. S. Annual Educational Session and Banquet in Schroeder Hotel on April 28.

12TH ANNUAL NEW ENGLAND REGIONAL MEETING in Hotel Taft, New Haven, Conn., on April 28.

FOURTH NATIONAL MATERIALS HANDLING EXPOSITION AND CONFERENCE in International Amphitheatre, Chicago, Ill., on April 30–May 4.

AMERICAN SOCIETY FOR TESTING MATERIALS Annual Meeting in Atlantic City, N. J., on June 18–22.

AMERICAN ELECTROPLATERS' SOCIETY Annual Convention in Hotel Statler, Buffalo, N. Y., on July 30-August 2.

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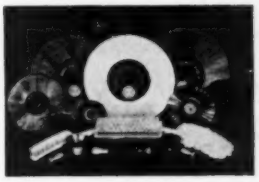

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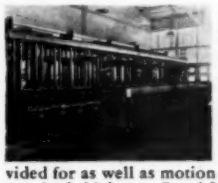

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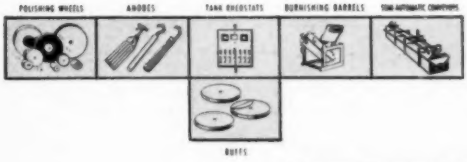

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